1st Draft: 22/10/10

TOSHIBA
Leading Innovation

FILE NO : A10-002P

Quick Reference

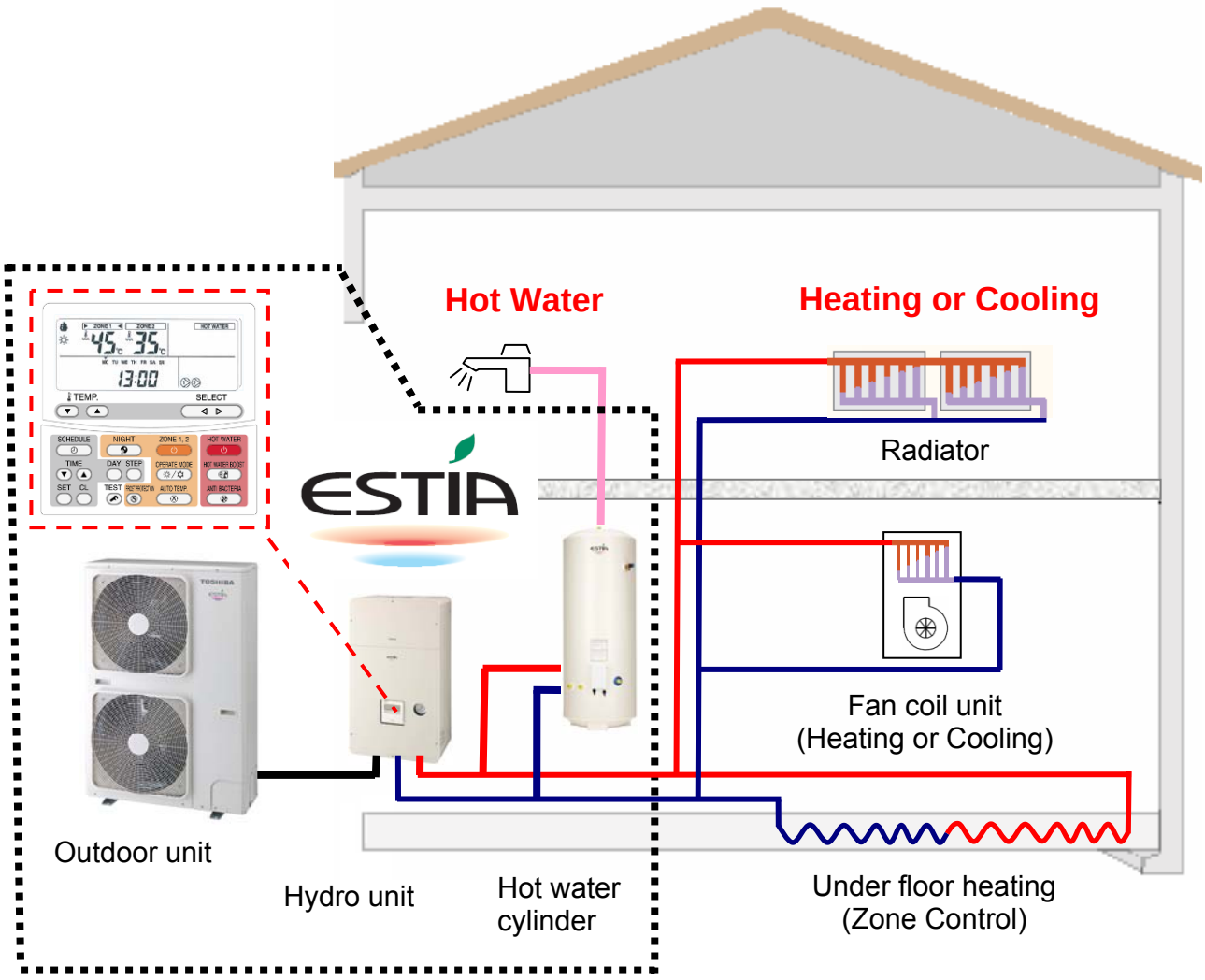
HFC
R410A

AIR TO WATER HEAT PUMP

ESTIA

Series 3

Estia System



Estia Outdoor Unit

HWS-803H-E (TR)	8.0kW Inverter: single phase
HWS-1103H-E (TR)	11.2kW Inverter: single phase
HWS-1403H-E (TR)	14.0kW Inverter: single phase
HWS-1103H8-E	11.2kW Inverter: three phase
HWS-1403H8-E	14.0kW Inverter: three phase
HWS-1603H8-E	16.0kW inverter: three phase
HWS-1103H8R-E	11.2kW Inverter; three phase with heater cord
HWS-1403H8R-E	14.0kW Inverter: three phase with heater cord
HWS-1603H8R-E	16.0kW Inverter: three phase with heater cord

Estia Hydro Unit

HWS-803XWHM3-E (TR)	Plate Heat exchanger and 3kW Backup Heater
HWS-803XWHT6-E (TR)	Plate Heat exchanger and 6kW Backup Heater
HWS-803XWHD6-E	Plate Heat exchanger and 6kW Backup Heater
HWS-803XWHT9-E	Plate Heat exchanger and 9kW Backup Heater
HWS-1403XWHM3-E (TR)	Plate Heat exchanger and 3kW Backup Heater
HWS-1403XWHT6-E (TR)	Plate Heat exchanger and 6kW Backup Heater
HWS-1403XWHD6-E	Plate Heat exchanger and 6kW Backup Heater
HWS-1402XWHT9-E (TR)	Plate Heat exchanger and 9kW Backup Heater

Estia Hot Water Cylinder (EU)

HWS-1501CSHM3-E	150L Stainless Steel Tank (with EU Accessories)
HWS-2101CSHM3-E	210L Stainless Steel Tank (with EU Accessories)
HWS-3001CSHM3-E	300L Stainless Steel Tank (with EU Accessories)

Estia Hot Water Cylinder (UK)

HWS-1501CSHM3-UK	150L Stainless Steel Tank (with UK Accessories)
HWS-2101CSHM3-UK	210L Stainless Steel Tank (with UK Accessories)
HWS-3001CSHM3-UK	300L Stainless Steel Tank (with UK Accessories)

Note:
Under floor heating, Fan Coil units, Radiators, valves and Hot Water Piping are procured locally.

Notes on System Design

• The input water temperature to the Hydro Unit must be 55°C or less.
Especially, be careful when there is an external heating source such as a boiler.
When hot water over 55°C returns, it may result in a failure of the unit or water leakage.
• The flow rate of the circulating water must meet the following range:-
11, 14 and 16 kW 17.5 L/minute or more
8 kW 13 L/minute or more
If the flow rate becomes less than the minimum, the protective device is activated to stop operation.
Ensure the flow rate with a bypass valve, etc. when you use a flow rate valve for the Hydro Unit.
• Do not drive water by power other than the pump built in the Hydro Unit.
• The backup heater operates supplementary to exert a prescribed capacity when the heat pump cannot exert its capacity at a low outside temperature.
• Install the Hydro Unit and water pipes in a place in which they do not freeze.
• Make the water circuit closed. Never use it as an open circuit.
• To prevent damage to the system the circulating water must be **20 litres or more**. If total water amount is not enough, the unit may not function fully due to protective operation.

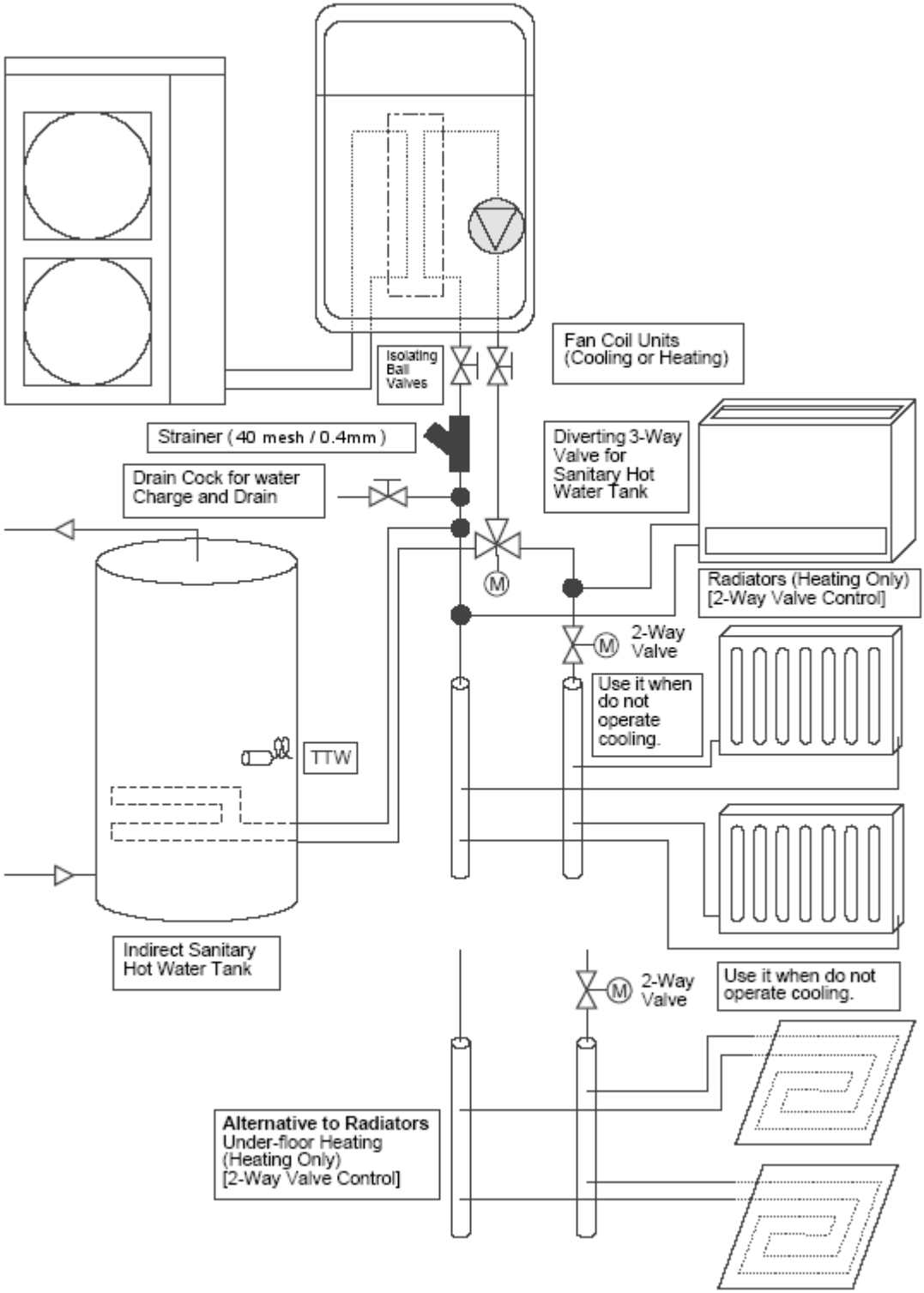
Components required for each function

Function	Toshiba Supply		Procure locally
	Part name	Model code	Part name
Heating	-	-	Radiator(s), Fan coil(s), Under floor heating
Heating & Cooling (All Rooms)	-	-	Fan coil(s) only
Heating & Cooling (partly heating only)	-	-	Fan coil(s) plus Radiator(s) or Under floor heating Motorized 2-way valve
Hot Water Supply	150L Hot water cylinder	HWS-1501CSHM3-E	Motorized 3-way valve Earth leakage breaker
	150L Hot water cylinder	HWS-1501CSHM3-UK	
	210L Hot water cylinder	HWS-2101CSHM3-E	
	210L Hot water cylinder	HWS-2101CSHM3-UK	
	300L Hot water cylinder	HWS-3001CSHM3-E	
	300L Hot water cylinder	HWS-3001CSHM3-UK	
2-zone control	-	-	Motorized mixing valve
			Circulator pump
			Buffer tank
Interlocking with boiler	External output board	TBC-PCIN3E	Boiler

Installation Examples

Cooling and Heating with Domestic Hot Water

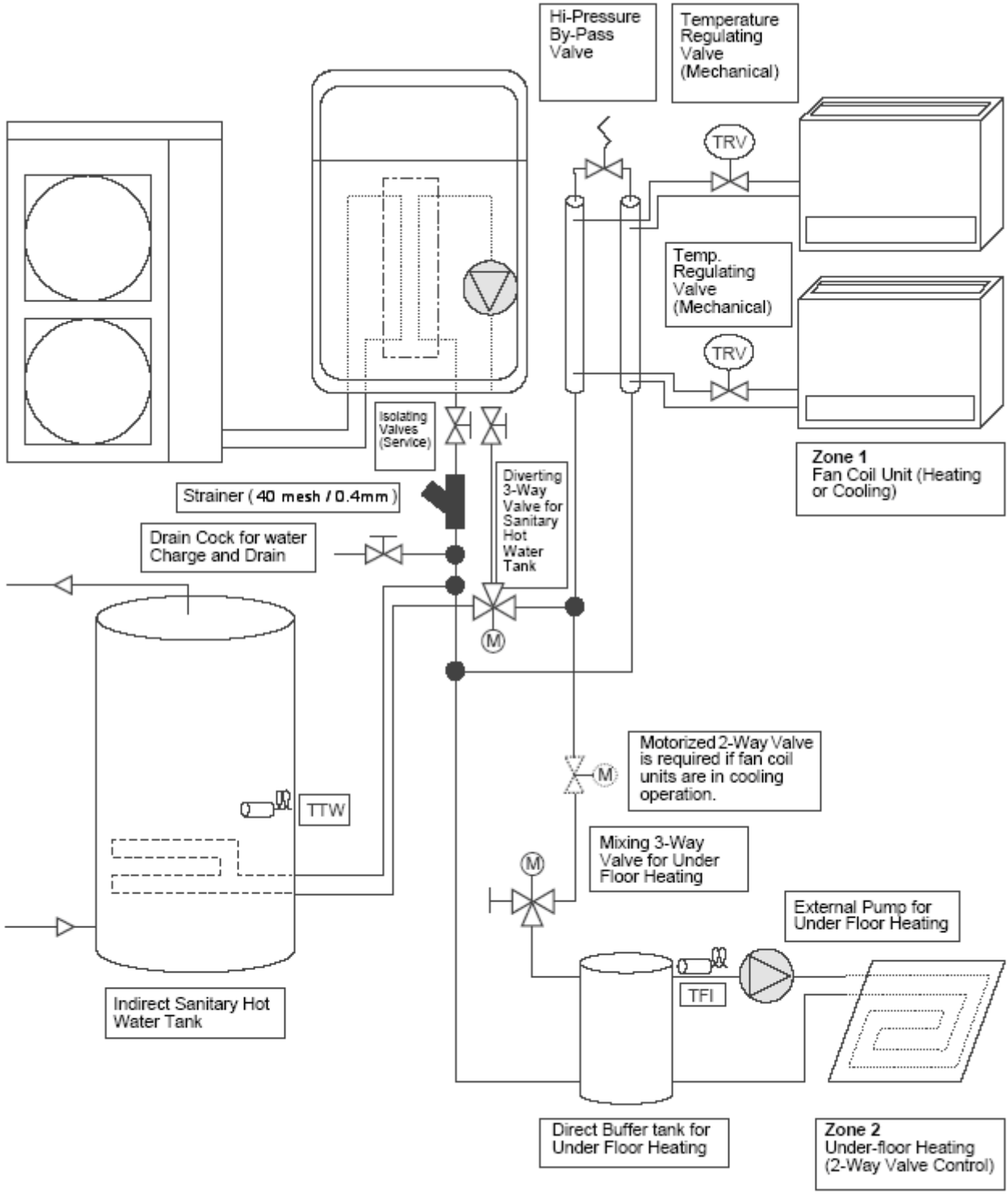
When both cooling and heating are used, install a 2-way valve (for cooling) to the pipe to the room for heating only.


Isolating Ball Valves
Fan Coil Units (Cooling or Heating)
Strainer (40 mesh / 0.4mm)
Drain Cock for water Charge and Drain
Diverting 3-Way Valve for Sanitary Hot Water Tank
M
Radiators (Heating Only) [2-Way Valve Control]
M 2-Way Valve
Use it when do not operate cooling.
TTW
Indirect Sanitary Hot Water Tank
M 2-Way Valve
Use it when do not operate cooling.
Alternative to Radiators
Under-floor Heating
(Heating Only)
[2-Way Valve Control]

Installation Examples (cont.)

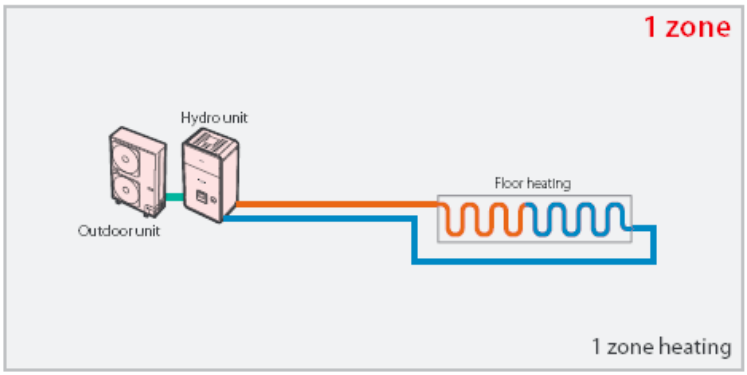
2-Zone Temperature Control with Domestic Hot Water

The following shows an example of the 2-zone temperature control.
A buffer tank and a water pump are required for the 2-zone temperature control. This example is Heating only, if the Fan Coils are to be used for Cooling then a 2-Way valve must be fitted.

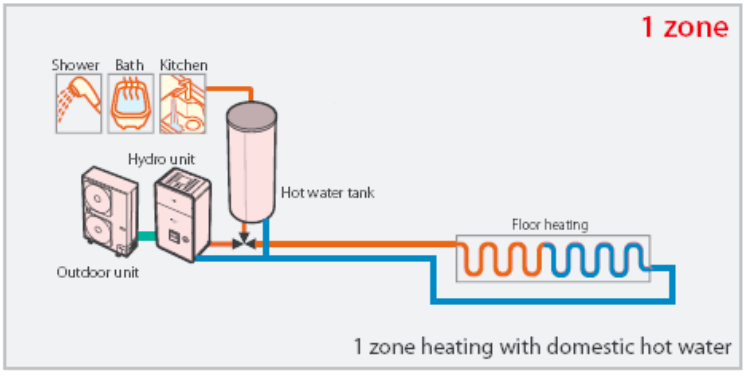

Hi-Pressure By-Pass Valve
Temperature Regulating Valve (Mechanical)
TRV
Temp. Regulating Valve (Mechanical)
TRV
Isolating Valves (Service)
Zone 1
Fan Coil Unit (Heating or Cooling)
Strainer (40 mesh / 0.4mm)
Diverting 3-Way Valve for Sanitary Hot Water Tank
Drain Cock for water Charge and Drain
M
Motorized 2-Way Valve is required if fan coil units are in cooling operation.
M
TTW
Mixing 3-Way Valve for Under Floor Heating
M
External Pump for Under Floor Heating
TFI
Indirect Sanitary Hot Water Tank
Direct Buffer tank for Under Floor Heating
Zone 2
Under-floor Heating (2-Way Valve Control)

Installation example of water circuit:-

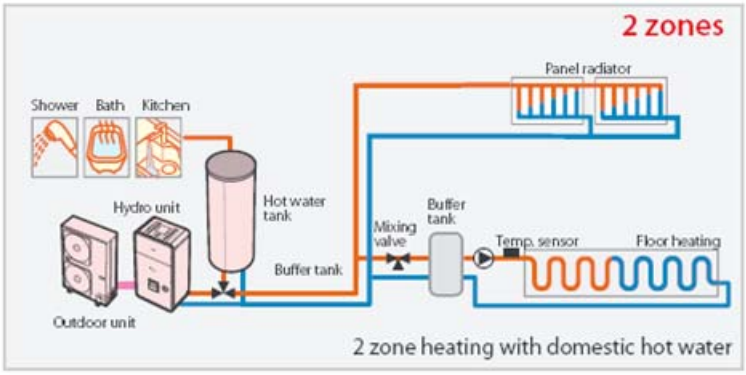
(1)



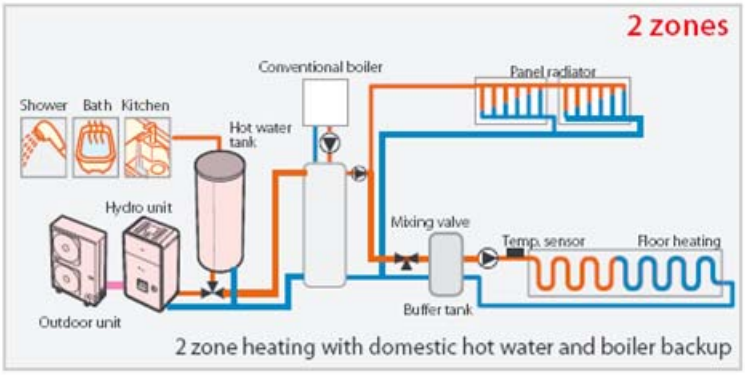
(2)



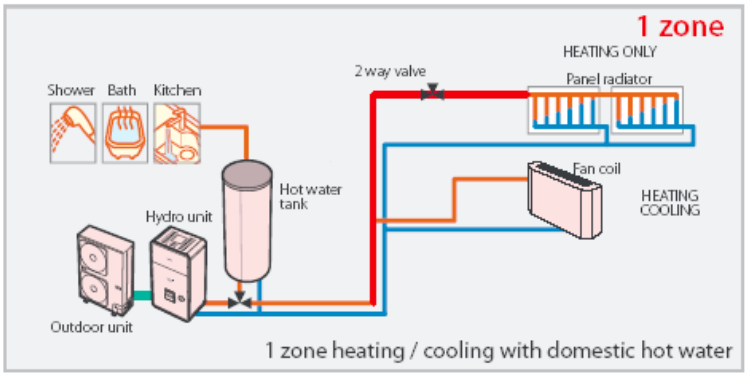
(3)



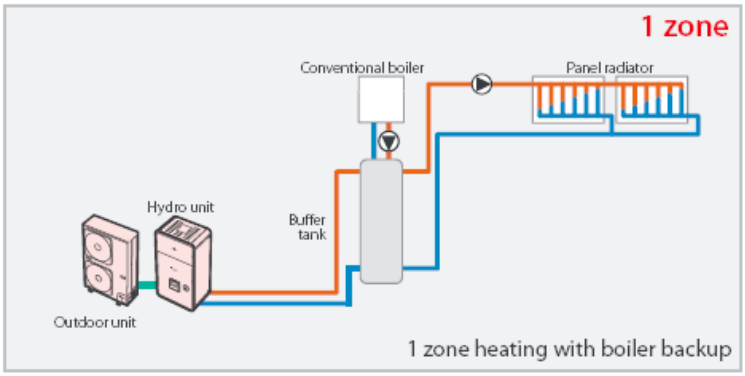
(4)



(5)

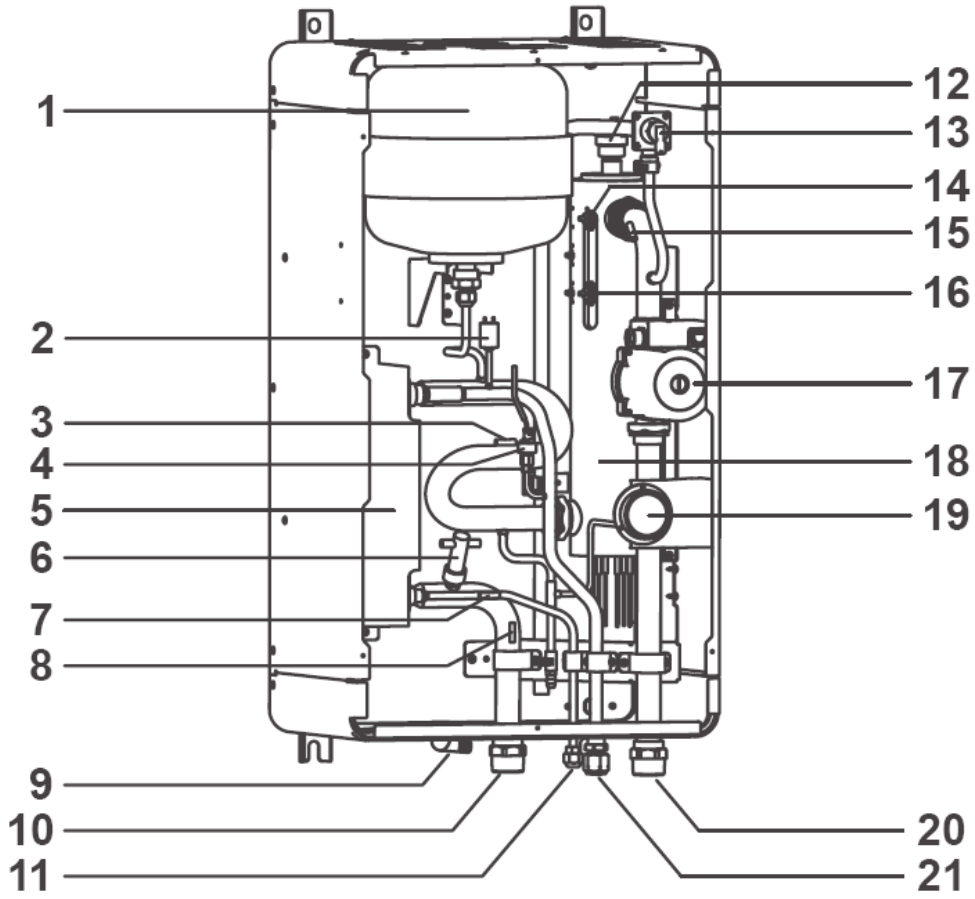


(6)



The water circuit for a system without a buffer tank [(1) , (2) , (3) , (5)] requires 17.5l/min (803XWH = 13.0l/min) or more. This water flowing requires 5 or more branches of Floor heating or Radiators etc.
Less than 5 branches may cause a flow deficiency. In this case, please provide a buffer tank and secondary pumps, as shown in (4).
Please check how to install the boiler.

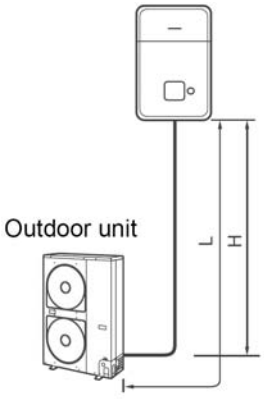
Hydro Unit – Exploded View



1 : Expansion vessel
2 : Hi Pressure switch (4.15 MPa)
3 : Temperature sensor (for Heat pump outlet -TWO)
4 : Pressure sensor
5 : Heat exchanger
6 : Flow switch (13.0 L/min 17.5 L/min)
7 : Temperature sensor (for refrigerant -TC)
8 : Temperature sensor (for water inlet -TWI)
9 : Drain nipple
10 : Water inlet connection
11 : Refrigerant liquid connection
12 : Air relief valve
13 : Pressure relief valve (0.3 MPa (3 bar))
14 : Thermal protector (auto)
15 : Temperature sensor (for water outlet THO)
16 : Thermal protector (Single operation)
17 : Water pump
18 : Backup heater (3 kW, 3 kW x 2, 3 kW x 3)
19 : Manometer
20 : Water outlet connection
21 : Refrigerant gas connection

Refrigerant Pipe Lengths and Height

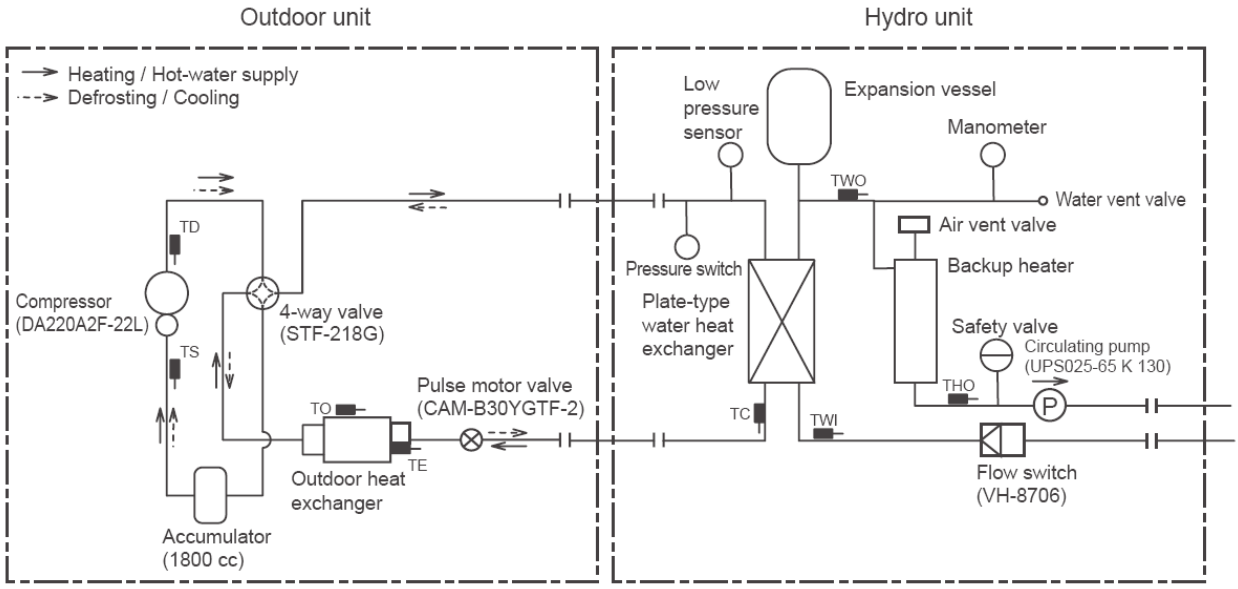
The length and height of the refrigeration pipe must be within the following values.
As long as the Hydro Unit is installed within these ranges, no additional refrigerant is required.



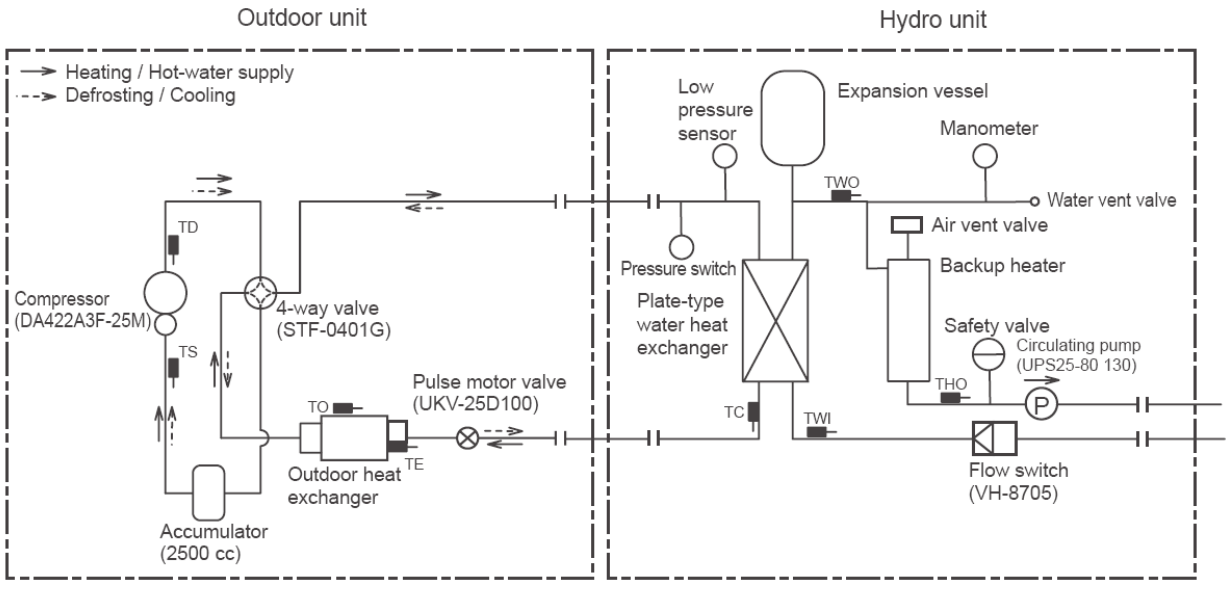
Minimum Pipe Length
HWS-803H-E : 5 m
HWS-1103H**-E : 5 m
HWS-1403H**-E : 5 m
HWS-1603H**-E: 5m
Maximum Pipe Length and Height
H: Max. ±30 m (above or below)
L: Max. 30 m
Note
The maximum pipe length cannot be increased using additional refrigerant.

Refrigeration and Water Cycle Diagrams

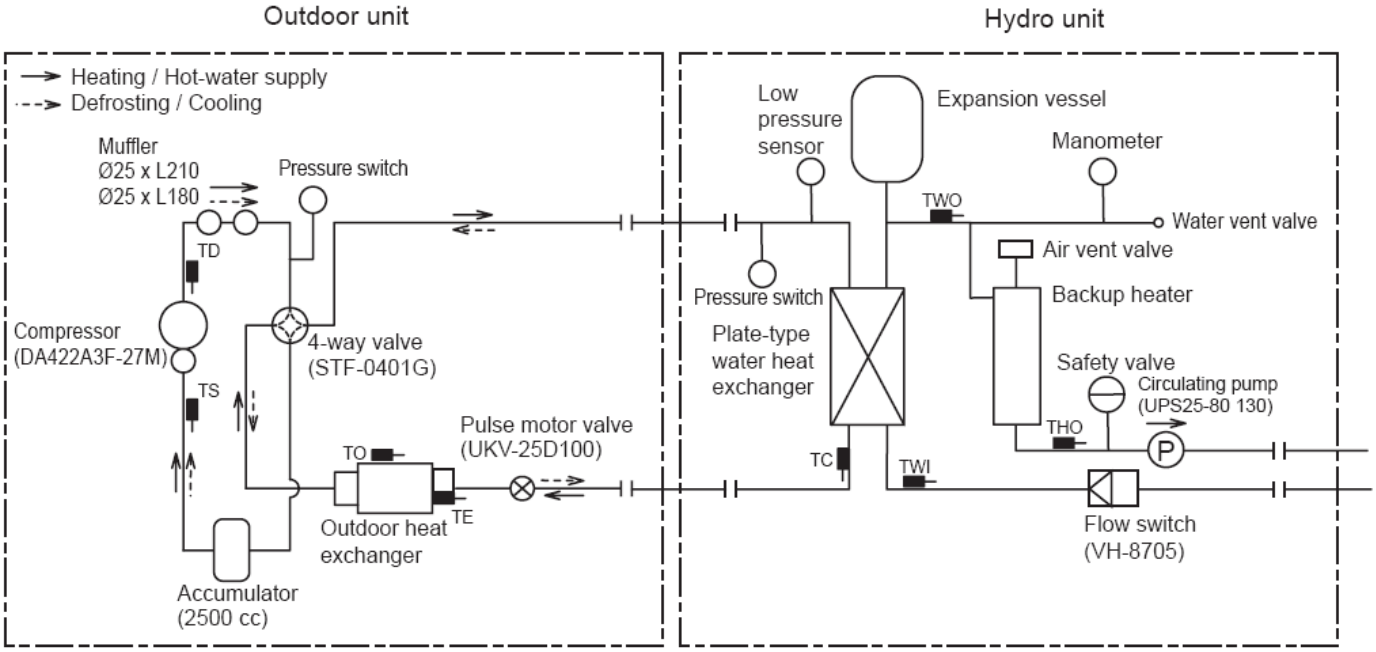
Outdoor Unit: HWS-803H-E
Hydro Units: HWS-803XWH-E**



Outdoor Units: HWS-1103H-E, HWS-1403H**-E**
Hydro Units: HWS-1403XWH-E**



Outdoor Units: HWS-1103H8(R)-E, HWS-1403H8(R)-E, HWS-1603H8(R)-E
Hydro Units: HWS-1403XWH-E**



Water Piping

⚠WARNING

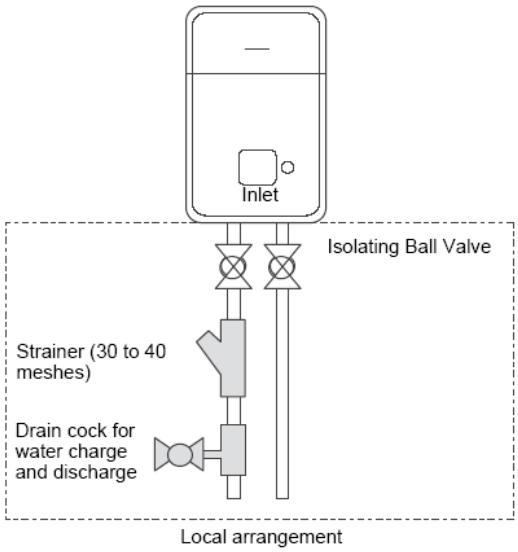
- Install water pipes according to the regulations of respective countries.
- Install water pipes in a freeze-free place.
- Make sure that water pipes have sufficient pressure resistance (The setting value of the pressure relief valve is 0.3 MPa).

⚠CAUTION

- Do not use zinc plated water pipes. When steel pipes are used, insulate both ends of the pipes.
- The water to be used must meet the water quality standards specified in EN directive 98/83 EC.

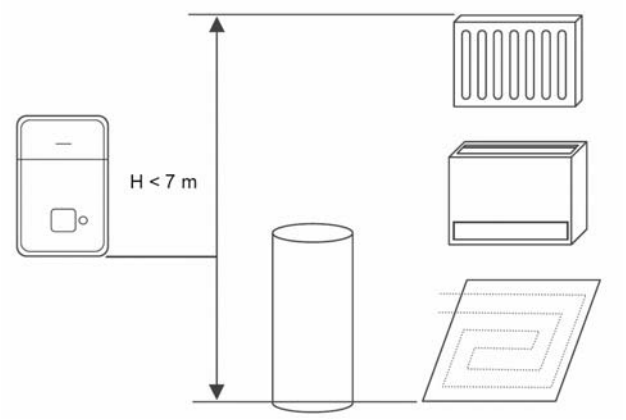
Water Circuit

- Install a strainer with 30 to 40 meshes (procure locally) at the water inlet of the Hydro Unit.
- Install drain cocks (procure locally) for water charge and discharge at the lower part of the Hydro Unit.
- Make the piping route a closed circuit. (An open circuit may cause a failure).



Local arrangement

Water Piping Limitations

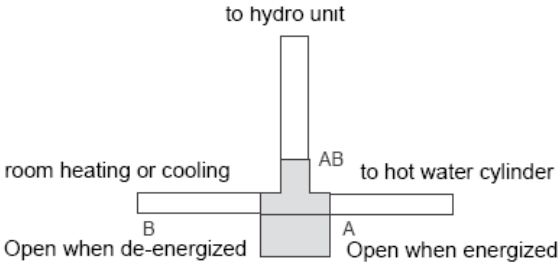


Design the water pipe length within the QH characteristics of the pump (flow-rate and pump head).

The maximum height difference for the water pipes is 7 metres.

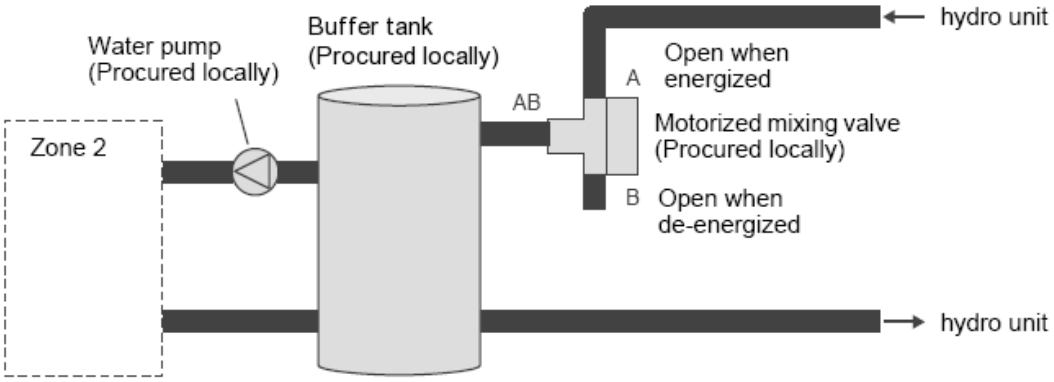
Piping to hot water tank (option)

Water supplied to the hot water cylinder is branched by a motorized 3-way valve (procured locally). Connect the hot water cylinder to port A (open when energized) of the valve.



Piping to 2-zone operation (option)

To perform 2-zone temperature control circulate water using another pump (procured locally) through a motorized mixing valve (procured locally) and a buffer tank (procured locally).



Checking water volume and initial pressure of expansion vessel

The expansion vessel of the Hydro Unit has a capacity of 12 litres.
The initial pressure of the expansion vessel is 0.1 MPa (1 bar).
The pressure of the safety valve is 0.3 MPa (3 bar).
Verify whether the capacity of the expansion vessel is sufficient using the following expression. If the volume is insufficient, install an appropriate external expansion vessel.

$$V = \frac{\varepsilon \times Vs}{1 - \frac{P1}{P2}}$$

V	Action
< 12 L	Internal Expansion Vessel Size OK
> 12 L	Internal Expansion Vessel Size too small. Install appropriate external expansion vessel

V: Necessary total vessel capacity (L)
Ɛ: Water expansion coefficient at average hot water temperature
Vs: Total water volume in the closed system (Do not include Hot Water Cylinder)
P1: System pressure at tank setting position (Mpa_abs*).
(Pipe inner pressure during pump operation before heating device operates = water supply pressure)
P2: Maximum pressure used during operation at tank setting position (MPa_abs*).
(= safety valve setting pressure)

* The absolute pressure value (abs.) is obtained by adding the atmospheric pressure (0.1 MPa (1 bar)) to the gauge pressure.

Water temperature and expansion coefficient (Ɛ)	
Hot water temperature (°C)	**Expansion rate** (Ɛ)
0	0.0002
4	0.0000
5	0.0000
10	0.0003
15	0.0008
20	0.0017
25	0.0029
30	0.0043
35	0.0050
40	0.0078
45	0.0100

Water temperature and expansion coefficient (Ɛ)	
Hot water temperature (°C)	**Expansion rate** (Ɛ)
50	0.0121
55	0.0145
60	0.0171
65	0.0198
70	0.0229
75	0.0258
80	0.0292
85	0.0324
90	0.0961
95	0.0967
-	-

Example

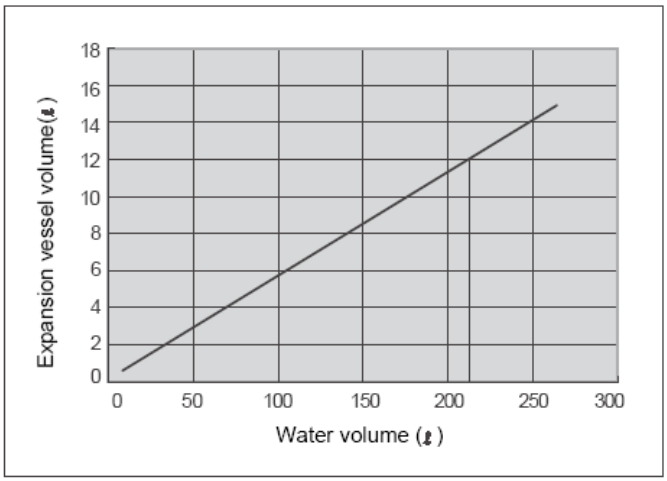
Maximum Hot Water temperature: 55°C
Initial water charge: 0.2MPa
System volume: 200 L.

Calculate Vessel capacity (V):-

$$V = \frac{0.0145 \times 200}{1 - \frac{(0.2 + 0.1)}{(0.3 + 0.1)}}$$

$$V = 11.6L$$

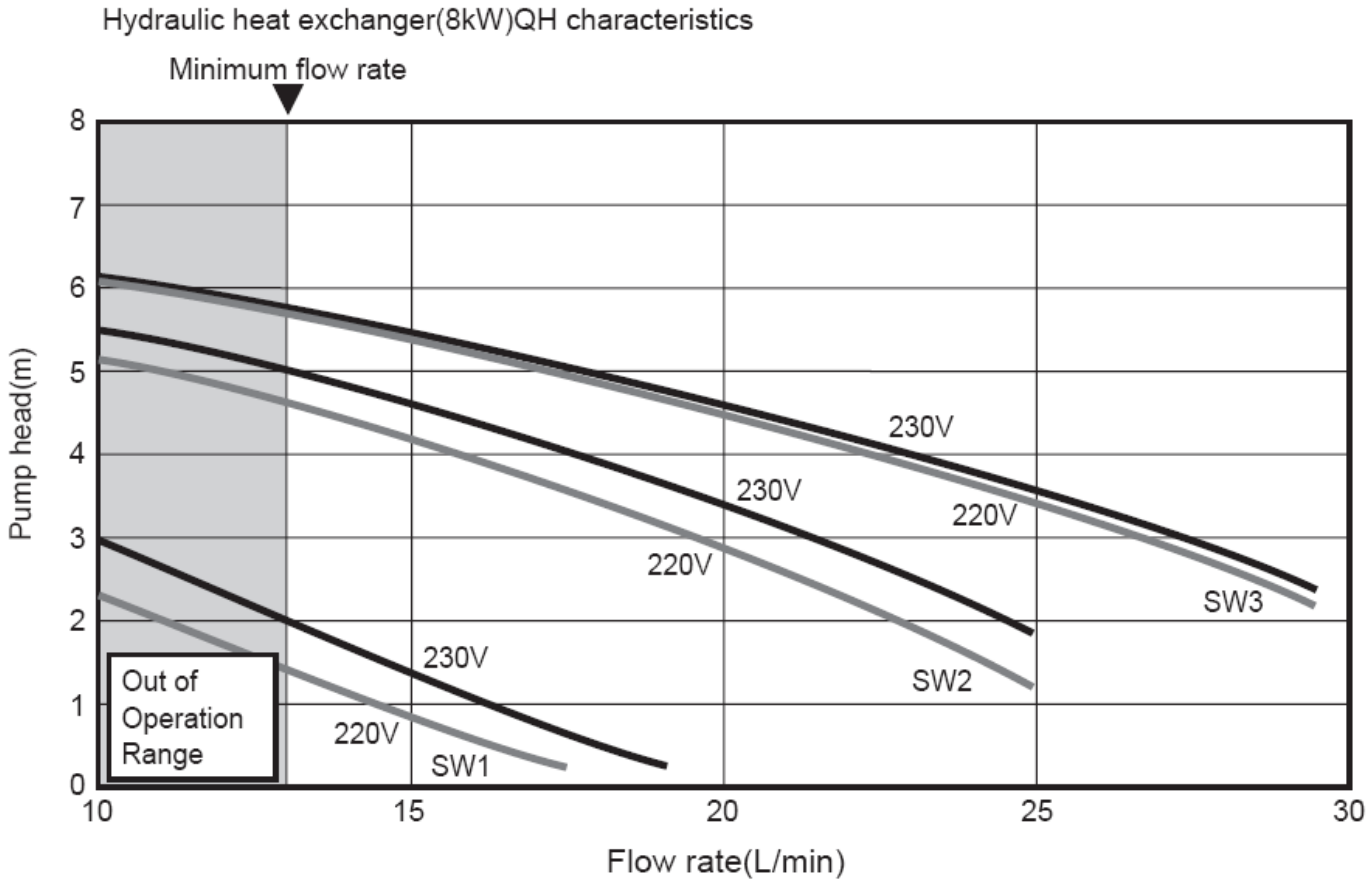
In this case V < 12 L therefore the internal expansion vessel is sufficient, so there is no need to install an external expansion vessel.



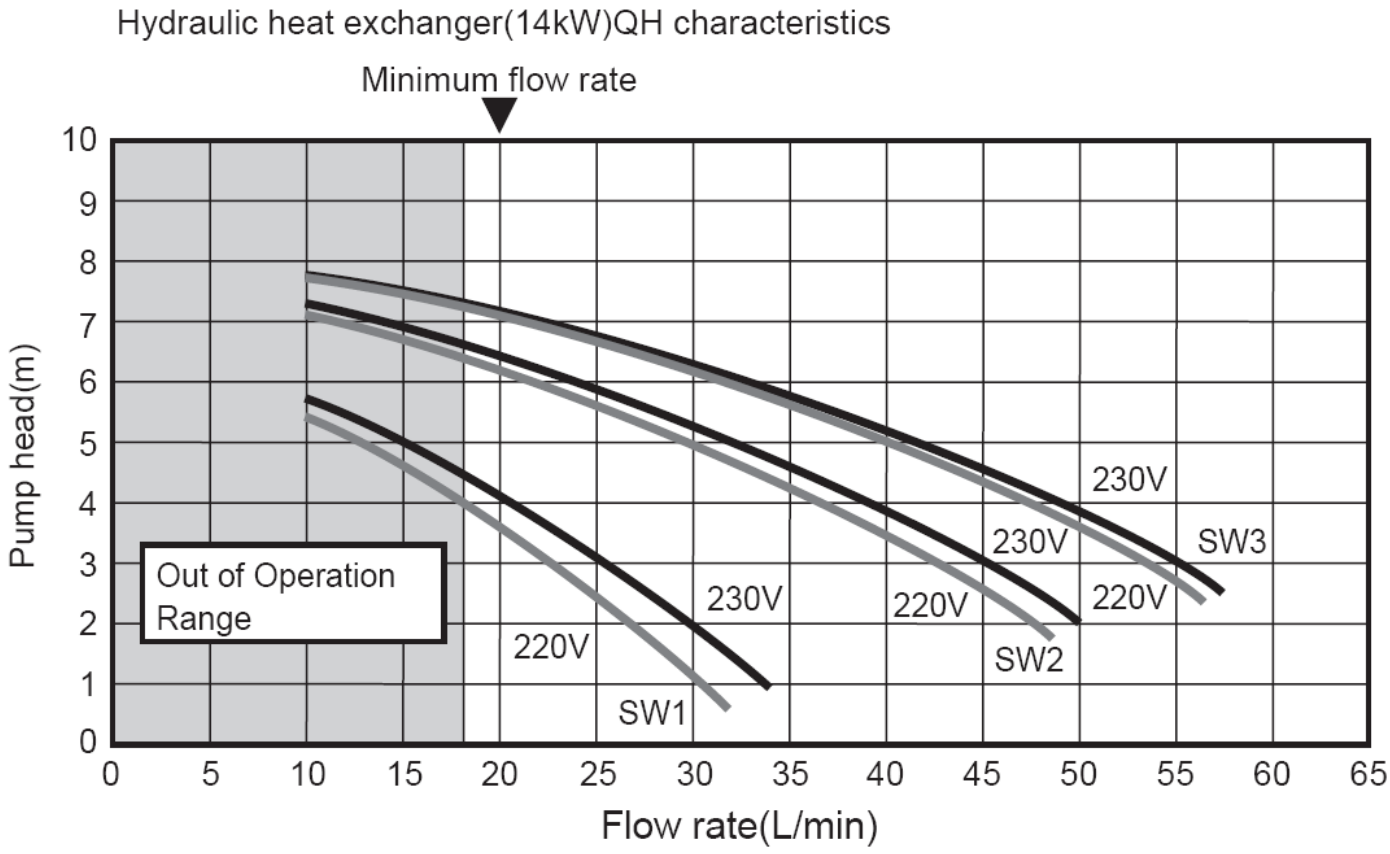
*Hot water temperature 55ºC

Pump operation / configuration

- **HWS-803XWHM3-E, T6-E, D6-E, T9-E**

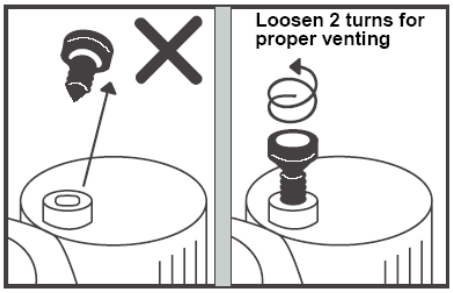


- **HWS-1403XWHM3-E, T6-E, D6-E, T9-E**



Water charging

Charge water until the pressure gauge shows 0.2 MPa (2 bar).
Hydraulic pressure may drop when the trial run begins. In that case, add water.
Air may enter if the charged hydraulic pressure is low.



Loosen the Air relief valve cap by two turns to release air (see diagram).

Loosen the cap of the pressure relief valve to release air. Water may come out of the pressure relief valve.

Release the air completely from the water circuit. Failure to do so may disable correct operation.

Water quality

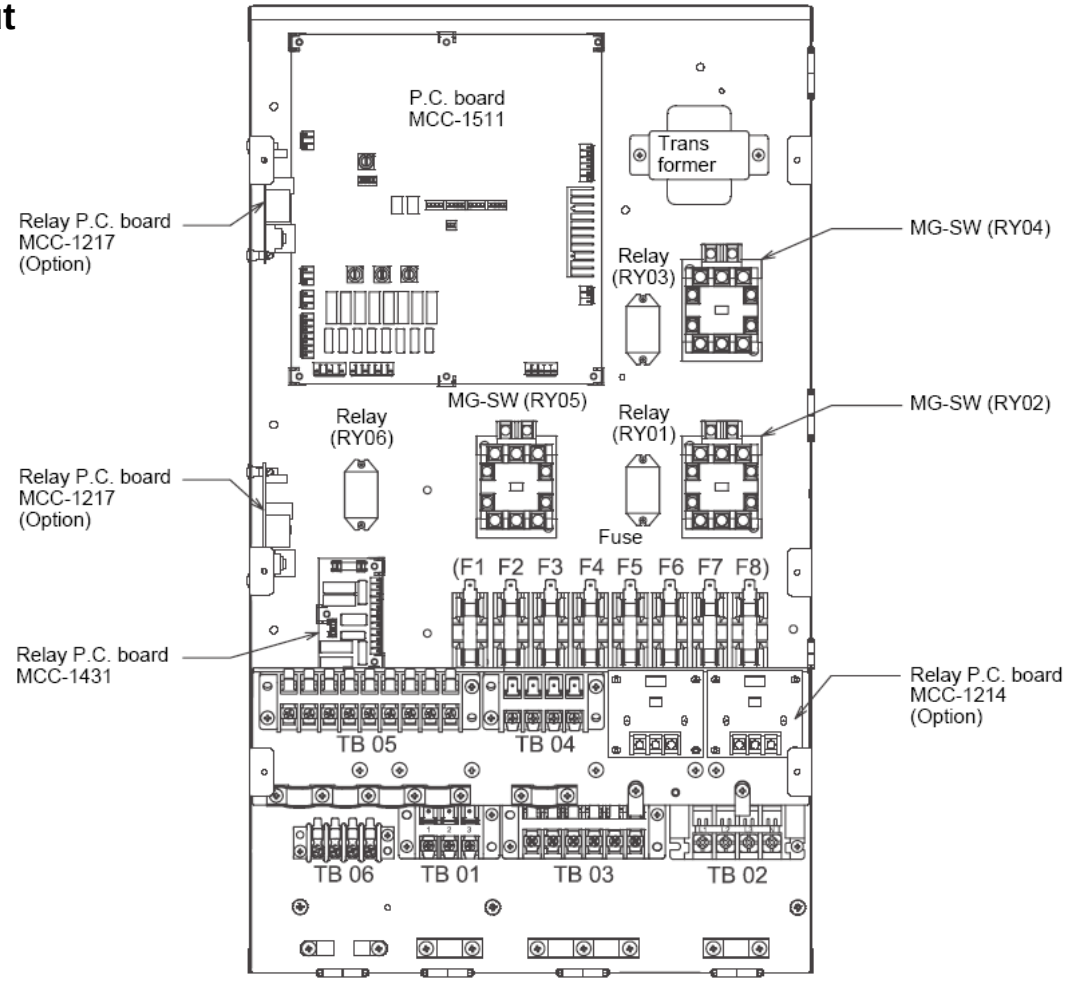
The water used must satisfy EN directive 98/83 EC.

Piping insulation

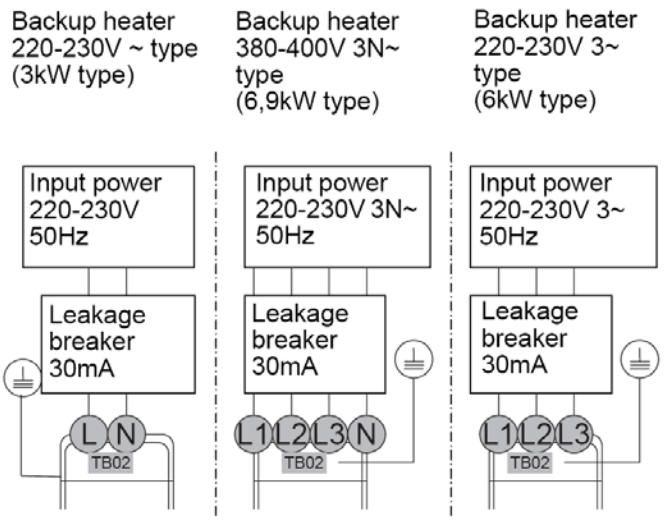
It is recommended that insulation treatment be applied to all pipes. To perform optional cooling operation, apply insulation treatment of 20 t or more to all pipes.

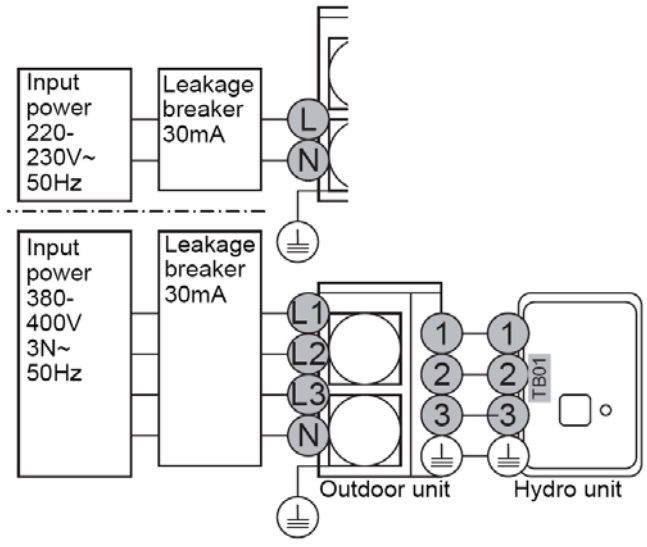
Electrical Connections

E Box layout

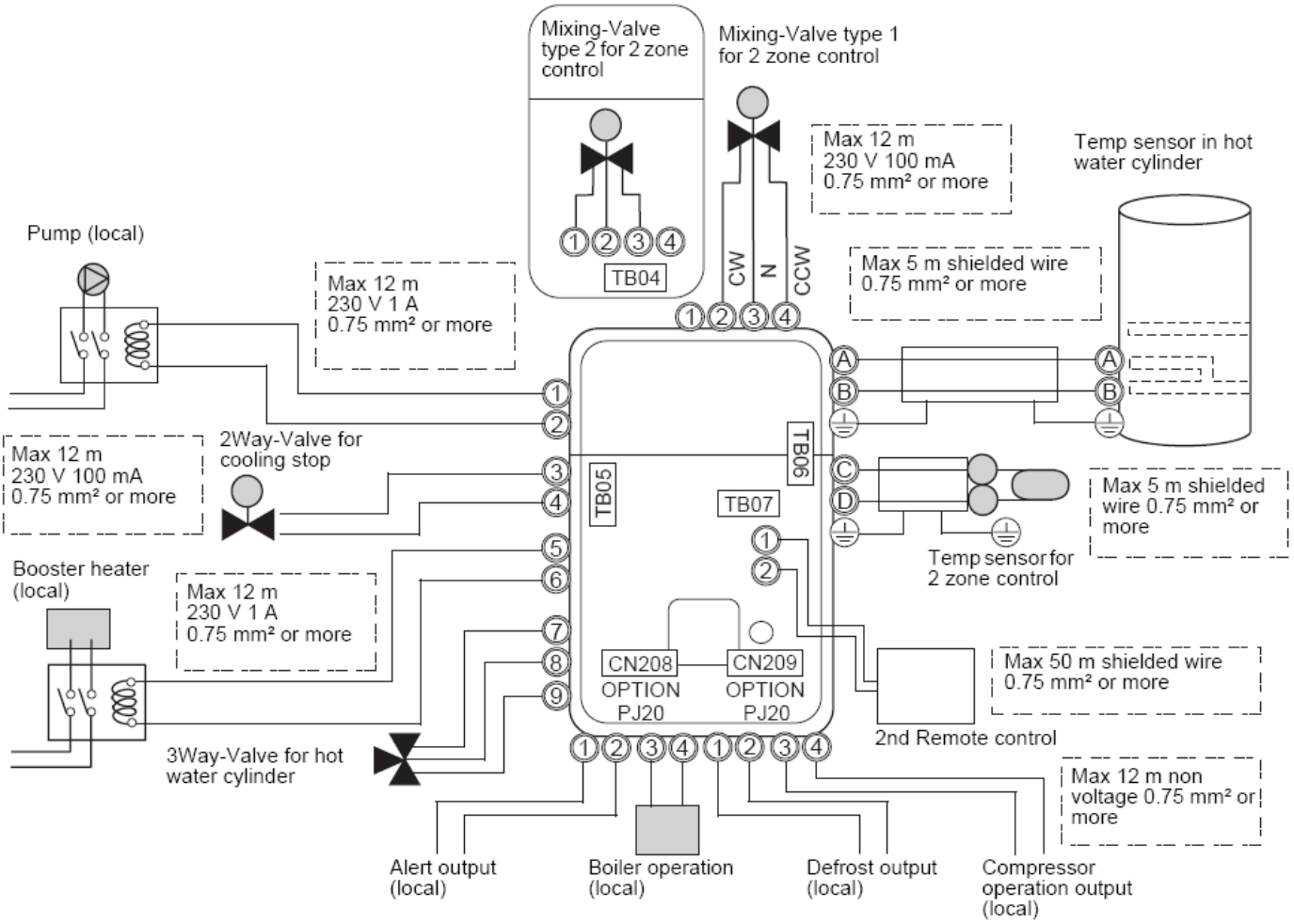


Power Lines Schematic

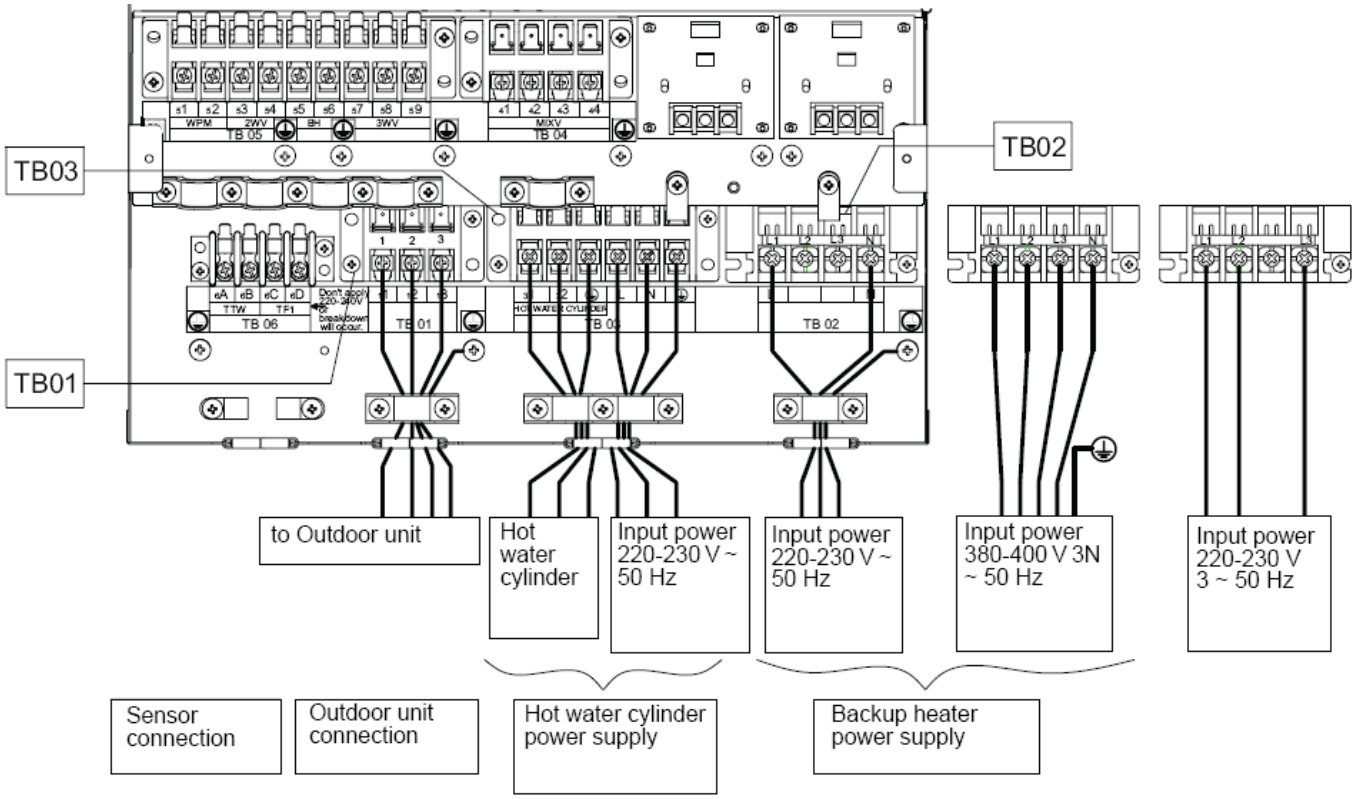




Control Lines Schematic



Terminal Block Connections



Electrical supply / cable specifications

Wiring specifications (power line)

Description		Model name HWS-	POWER SUPPLY	Maximum current	Installation fuse rating	Power wire	Connection destination	
Outdoor unit power	Power input	1403H-E	220-230 V ~ 50 Hz	22.8A	25 A	2.5 mm² or more	Ⓛ, Ⓝ	
		1103H-E	220-230 V ~ 50 Hz	22.8A	25 A	2.5 mm² or more		
		803H-E	220-230 V ~ 50 Hz	19.2A	20A	2.5 mm² or more		
		1603H8-E, 1603H8R-E	380-400V 3N~ 50Hz	14.6A	16A	2.5 mm² or more	Ⓛ1, Ⓛ2, Ⓛ3, Ⓝ	
		1403H8-E, 1403H8R-E	380-400V 3N~ 50Hz	14.6A	16A	2.5 mm² or more		
		1103H8-E, 1103H8R-E	380-400V 3N~ 50Hz	14.6A	16A	2.5 mm² or more		
Hydro inlet heater power	Power input for backup heater	1403XWHM3-E	220-230V ~ 50Hz	13A	16A	1.5 mm² or more	Ⓛ, Ⓝ	TB02
		1403XWHD6-E	220-230V 3~ 50Hz	23A	25A	2.5 mm² or more	Ⓛ1, Ⓛ2, Ⓛ3	
		1403XWHT6-E	380-400V 3N~ 50Hz	13A(13A x 2P)	16A	1.5 mm² or more	Ⓛ1, Ⓛ2, Ⓛ3, Ⓝ	
		1403XWHT9-E	380-400V 3N~ 50Hz	13A(13A x 3P)	16A	1.5 mm² or more		
		803XWHM3-E	220-230V ~ 50Hz	13A	16A	1.5 mm² or more	Ⓛ, Ⓝ	
		803XWHD6-E	220-230V 3~ 50Hz	23A	25A	2.5 mm² or more	Ⓛ1, Ⓛ2, Ⓛ3	
		803XWHT6-E	380-400V 3N~ 50Hz	13A(13A x 2P)	16A	1.5 mm² or more	Ⓛ1, Ⓛ2, Ⓛ3, Ⓝ	
		803XWHT9-E	380-400V 3N~ 50Hz	13A(13A x 3P)	16A	1.5 mm² or more		
	Power input for cylinder heater		220-230V ~ 50Hz	12A	16A	1.5 mm² or more	Ⓛ, Ⓝ	TB03
Outdoor-Hydro unit		Connection				1.5 mm² or more	①, ②, ③	
Hydro -Cylinder		Connection				1.5 mm² or more	①, ②	TB03

Wiring specification (control line)

Description	Line spec	Maximum current	Maximum length		Connection destination
3-way valve control	2 line or 3 line	100 mA	12 m	0.75 mm² or more	⑦, ⑧, ⑨ (TB05)
2-way valve control	2 line	100 mA	12 m	0.75 mm² or more	③, ④ (TB05)
Mixing valve control	3 line	100 mA	12 m	0.75 mm² or more	①, ②, ③ or ②, ③, ④ (TB04)
2-zone thermo sensor	2 line	100 mA	5 m	0.75 mm² or more	Ⓒ, Ⓓ (TB06)
Cylinder thermo sensor	2+GND(shielded wire)	100 mA	5 m	0.75 mm² or more	Ⓐ, Ⓑ (TB06)
Second remote controller	2 line	50 mA	50 m	0.5 mm² or more	①, ② (TB07)

Control parts specifications

	Power	Maximum current	Type
Motorized 3-way valve (for hot water)	AC 230 V	100 mA	Default: 2-wire spring return valve or 3 wire SPST valve Note: 3 wire SPDT valve can be used by changing DIP switch 13_1.
Motorized 2-way valve (for cooling)	AC 230 V	100 mA	spring return type (normally open)
Motorized mixing valve (for 2-zone)	AC 230 V	100 mA	Default: Drive time = 60sec to 90° Note: 3 wire SPST or SPDT valves, with drive times between 30 and 240 seconds, can be used. Valve drive time can be changed using function code 0C

Output line specifications

Description	Output	Maximum current	Max voltage	Maximum length	
External pump No.1	AC230V	1 A	–	12 m	
External boost heater	AC230V	1 A	–	12 m	Output as required when outdoor air temperature is -20°C or less
Boiler control	Non-voltage contacts	0.5 A	AC230 V	12 m	Output as required when outdoor air temperature is -10°C or less. The outdoor air temperature, when the boiler output is enabled, can be changed using function code 23.
		1 A	DC24 V	12 m	
ALARM Output	Non-voltage contacts	0.5 A	AC230 V	12 m	
		1 A	DC24 V	12 m	
Compressor operation output	Non-voltage contacts	0.5 A	AC230 V	12 m	
		1 A	DC24 V	12 m	
Defrost Output	Non-voltage contacts	0.5 A	AC230 V	12 m	
		1 A	DC24 V	12 m	

Input line specifications

Description	Input	Maximum length
Emergency stop control	Non-voltage	12 m
Cylinder thermostat input	Non-voltage	12 m
Cooling thermostat input	Non-voltage	12 m
Heating thermostat input	Non-voltage	12 m

⚠CAUTION

Earthing arrangements

The Hydro Unit and related equipment must be earthed in accordance with your local and national electrical regulations.

It is essential that the equipment is earthed to prevent the electric shock and damage to the equipment.

Electrical connection to hydro unit

• Remove the front cover and the electrical box cover from the Hydro Unit.

• The Hydro Unit power cable must be sized in accordance with refer to “Electrical supply/cable specifications”.

• Connect the Hydro Unit power cable to Terminal 02 as shown below.

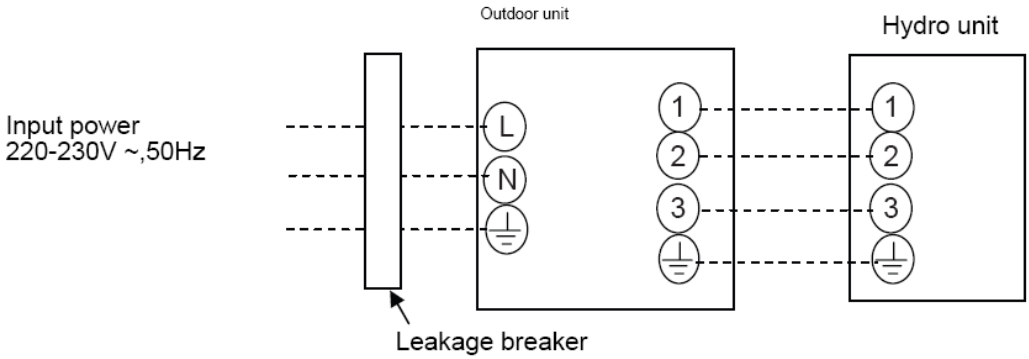
Single Phase Units:	Live conductor – Terminal L1
	Neutral conductor – Terminal L2
	Earth conductor – Earth terminal
Three Phase Units:	Phase 1 conductor – Terminal L1
	Phase 2 conductor – Terminal L2
	Phase 3 conductor – Terminal L3
	Neutral conductor – Terminal N
	Earth conductor – Earth

• Ensure the Hydro Unit power cable is secured using the cable clamp fitted in the electrical box.

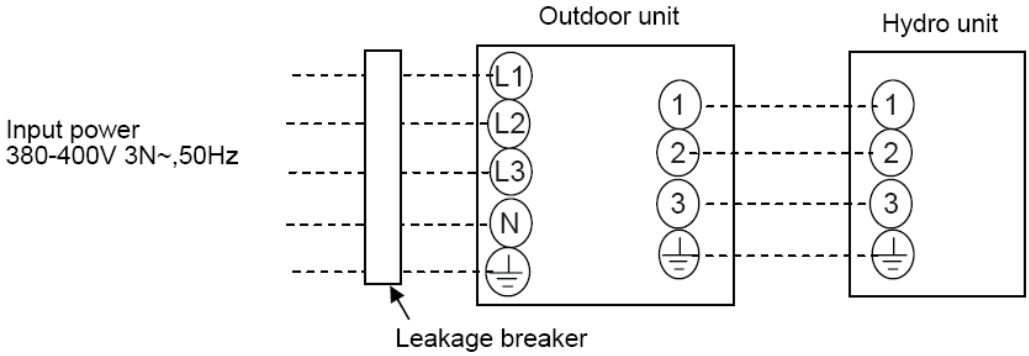
• Ensure the Hydro Unit power cable connection terminals are tight.

Outdoor unit to hydro unit electrical connection

HWS-803H-E
HWS-1103H-E
HWS-1403H-E



HWS-1103H8-E, H8R-E
HWS-1403H8-E, H8R-E
HWS-1603H8-E, H8R-E



• Ensure electrical circuits are isolated before commencing work.

• The Outdoor Unit to Hydro Unit interconnecting cable must be sized in accordance with refer to “Electrical supply/cable specifications”.

• Connect the Outdoor Unit to Hydro Unit interconnecting cable as shown in the diagram above.

• Ensure the Outdoor Unit to Hydro Unit interconnecting cable is secured using the cable clamp fitted in the electrical box.

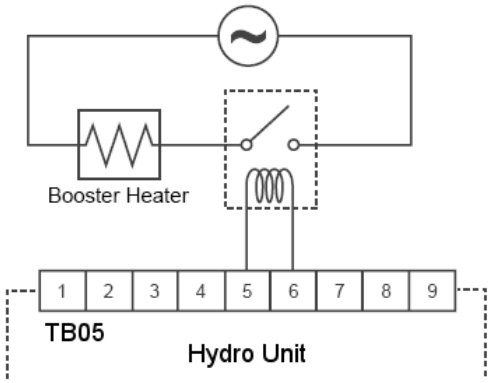
• Ensure the Outdoor Unit to Hydro Unit interconnecting cable connection terminals are tight.

Electrical connection for external booster heater

⚠CAUTION

• The maximum current available from the booster heater output is 1 A. Do not connect the booster heater directly to Terminal Block 05 on the Hydro Unit. A separate contactor, supplied locally, must be used to supply the booster heater.
• The booster heater can be installed only for room heating and cannot be used for hot water supply.
• Install the booster heater downstream of the 3-way valve on the indoor unit side.
• The booster heater is an external heater, supplied locally, used to assist the Hydro Unit during low ambient conditions.
• The AC230 V 1 A output from the Hydro Unit must only be used to energize an external contactor (supplied locally).
• The output from the Hydro Unit is only enabled when either the outdoor air temperature to be lower than -20°C.
• Ensure the external booster heater is installed and set up in accordance with all Local, National and International regulations.

• Connect the external booster heater to the Hydro Unit according to the diagram shown opposite:-
• The contactor will energize in the event of low ambient conditions.
• A separate dedicated electrical supply must be used for the external booster heater. This must be connected through the contacts on the field supplied contactor.

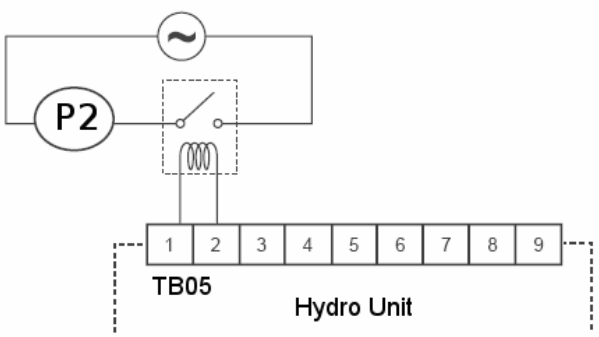


Electrical connection for external additional pumps

⚠CAUTION

• The maximum current available from the additional pump output is 1 A. Do not connect the additional pump directly to Terminal Block 05 on the Hydro Unit. A separate contactor, supplied locally, must be used to supply the additional pump.
• The Hydro Unit has the facility to connect an additional circulating pump, if required, into the heating or cooling system.
• Install the pump so that its motive power does not affect the internal pump.
• The AC230 V 1 A output from the Hydro Unit must only be used to energize an external contactor (supplied locally).
• The output for the pump is synchronized with the operation of the main circulating pump (P1) inside the Hydro Unit.
• Ensure the pump is installed and set up in accordance with all Local, National and International regulations.

• Connect the additional pump (P2) as shown in the diagram opposite:-
• The contactor will energize synchronously with operation of the main circulation pump (P1).
• A separate dedicated electrical supply must be used for the pump. This must be connected through the contacts on the field supplied contactor.



3-way valve (diverter) connection

Required Valve Specification:

Electrical Specification: 230 V; 50 Hz; <100 mA
Valve Diameters: Port A, Port B: Ø 1 1/4"
Return Mechanism: 3 types of 3-way valve (diverter) can be used.
Set the 3-way valve in use with the DIP switch SW13-1 on the Hydro Unit board.

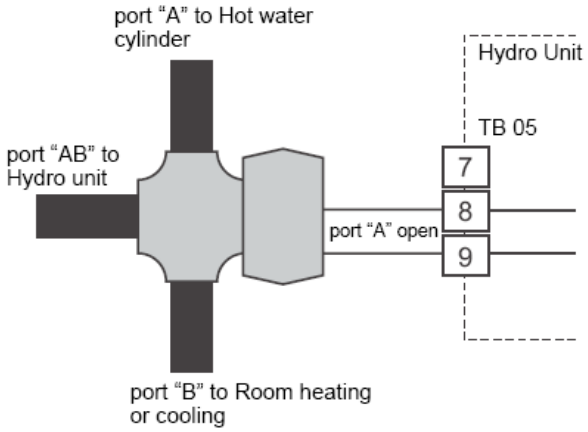
Diverter Valve	Description	SW13-1
Type 1	2-wire spring return	OFF
Type 2	3-wire SPST	OFF
Type 3	3-wire SPDT	ON

NOTE

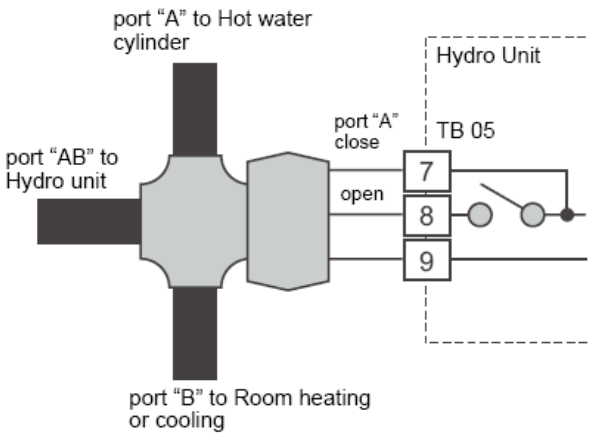
Continuous operation of the valve motor at the fully open position is not recommended.

• The 3-way diverter valve is used to select either domestic hot water or zone1 / zone2.
• Connect the 3-way diverter valve in accordance with the diagram below:-

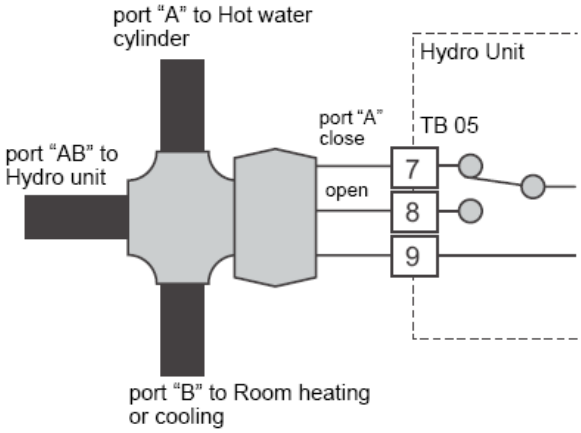
Type 1: SPRING RETURN



Type 2: SPST



Type 3: SPDT



3-way mixing valve connection

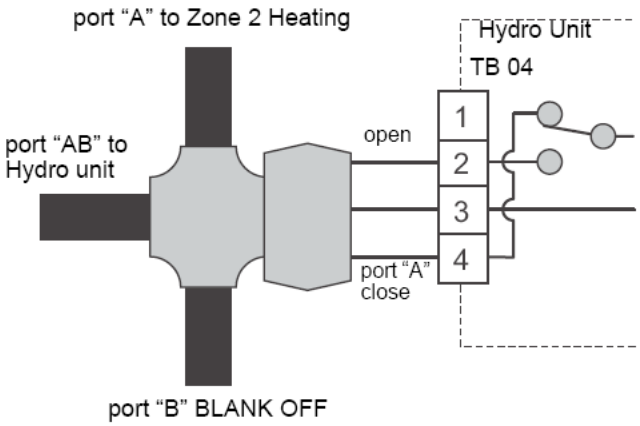
Required Actuator Specification

Electrical Specification:230 V; 50 Hz; <100 mA

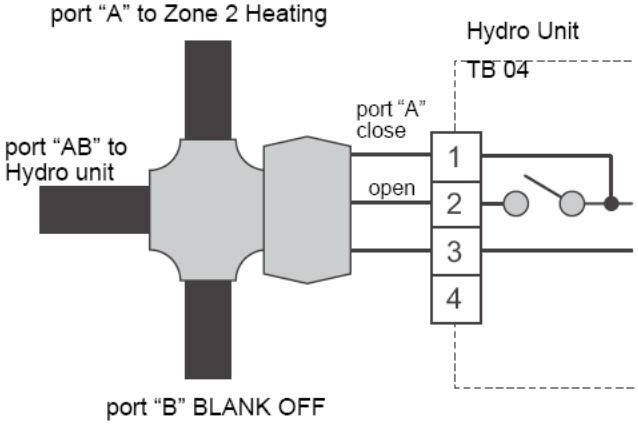
The 3-way mixing valve is used to achieve the temperature differential needed in a 2-zone heating system.

• Connect the 3-way mixing valve in accordance with the diagrams below:-

Type 1: SPDT



Type 2: SPST



Hot water cylinder connection (optional)

• Please refer to "Electrical supply/cable specifications" for fuse/cable size and for connection details.

Electrical Connection (Hot Water Cylinder Electric Heater)

• The electric heater, incorporated in the hot water cylinder, requires a separate supply to the Hydro Unit.

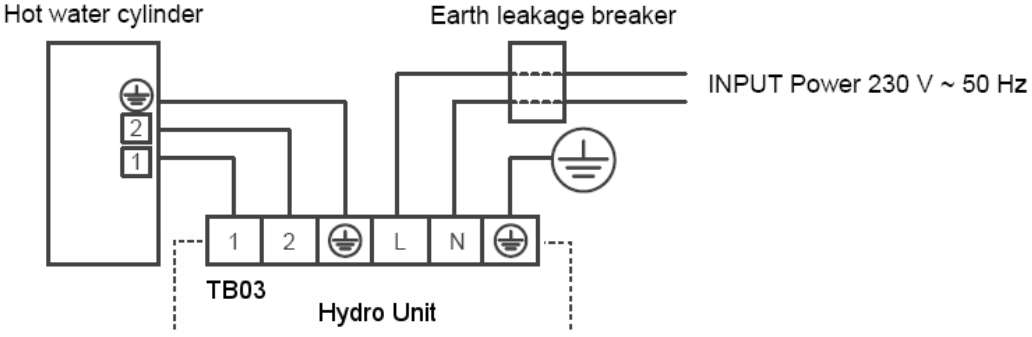
• Connect the hot water cylinder heater electrical supply in accordance with shown below:
Live conductor: Terminal L on Terminal Block 03
Neutral conductor: Terminal N on Terminal Block 03
Earth Conductor: Earth terminal on Terminal Block 03

• Connect the hot water cylinder heater to the Hydro Unit as shown below:
Live conductor to hot water cylinder: Terminal 1 on Terminal Block 03
Neutral conductor to hot water cylinder: Terminal 2 on Terminal Block 03
Earth conductor to hot water cylinder: Earth terminal on Terminal Block 03

Electrical Connection (Hot Water Cylinder temperature Sensor)

• Connect the hot water cylinder temperature sensor as shown below to terminals A & B on Terminal Block 06 in the Hydro Unit.

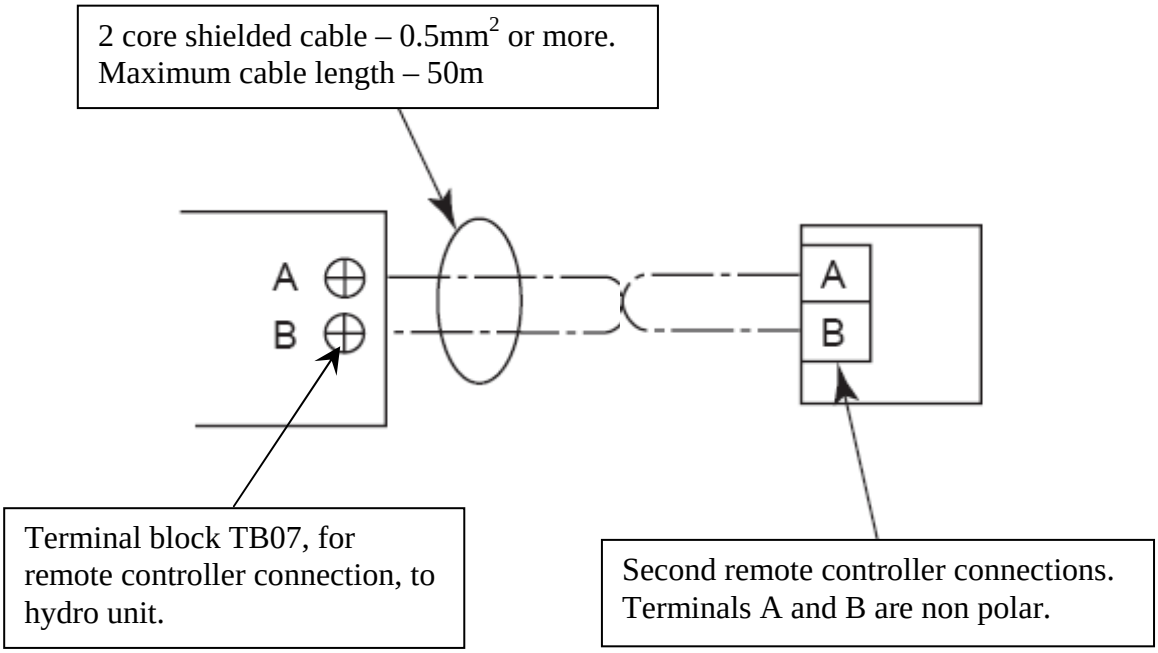
• Please ensure that the interconnecting cable, between the Hydro Unit and the hot water cylinder, is connected to earth at both ends of the cable using the shield wire.



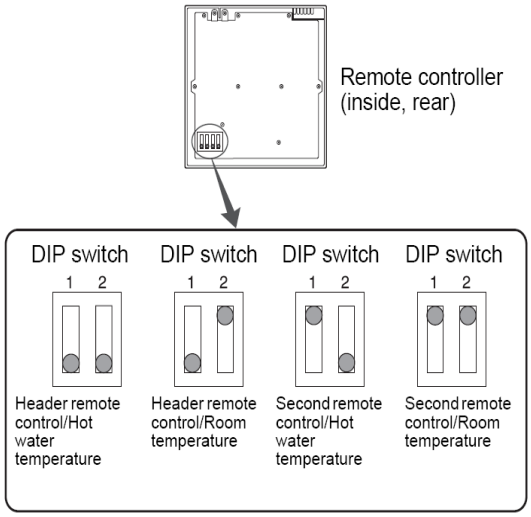
Second Remote Controller Installation (optional)

It is possible to connect a second remote controller to the ESTIA system. The remote controller can be set as either the header or second remote controller and to measure either water temperature or room air temperature.

Second Remote Controller Connection


2 core shielded cable – 0.5mm^2 or more.
Maximum cable length – 50m
A
B
A
B
Terminal block TB07, for remote controller connection, to hydro unit.
Second remote controller connections. Terminals A and B are non polar.

Remote Controller DIPS Switches - Setting



- Set one of the remote controllers as the header remote controller (remote controller of hydro unit is preset as the header remote controller (DPSW1 = OFF)
- Set the DPSW's on the other remote controller PC boards to "second" (optional remote controller is preset as "second" – DPSW1 = ON)

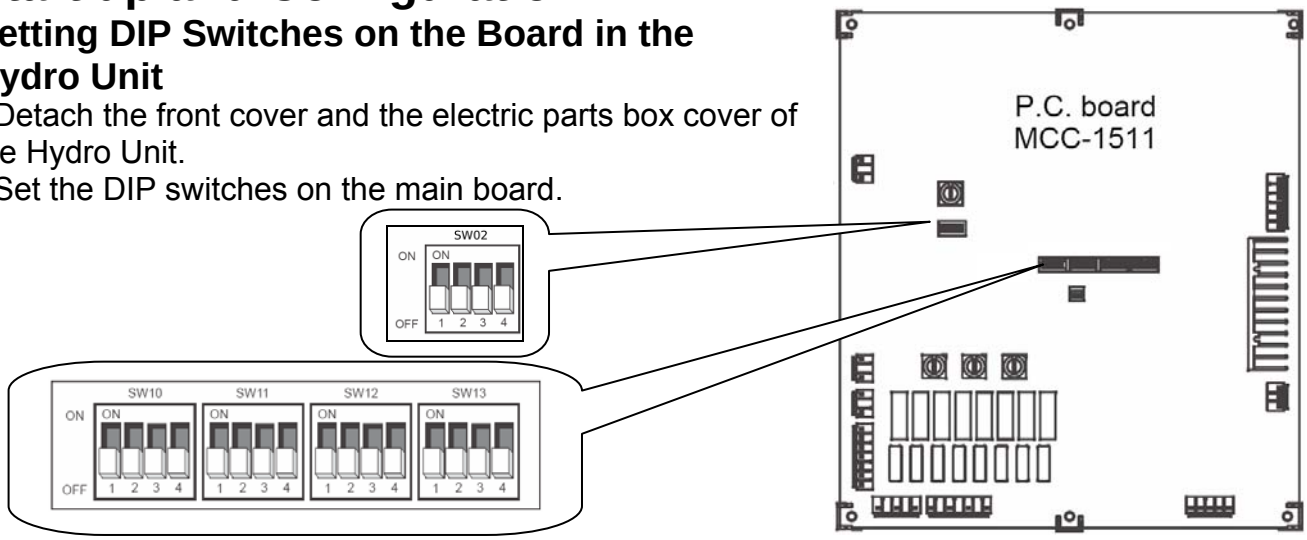
For room air temperature measurement

- set function code 40 (on the hydro unit) to "1"
- Set DPSW2 to ON on the remote controller used for room temperature measurement
- Either the header or the second remote controller can be set for room temperature measurement

Start up and Configuration

Setting DIP Switches on the Board in the Hydro Unit

• Detach the front cover and the electric parts box cover of the Hydro Unit.
• Set the DIP switches on the main board.



SW10	Description	Switch mode			
		Default setting		Alternate	
1	Pump P1 control during hot water production	P1 stops when heat pump stops (cylinder heater ON)	OFF	ON	P1 continuous operation
2	Pump P1 control using outside air temperature	Normal Control	OFF	ON	P1 operation controlled by outside air temperature
3	External P2 pump operation	Continuous operation (P2 OFF when remote controller OFF)	OFF	ON	Interlocked with the internal pump synchronised with P1.

SW11	Description	Switch mode			
		Default setting		Alternate	
1	Internal backup heater operation	Operate	OFF	ON	Not operate
2	Hot water cylinder heater operation	Operate	OFF	ON	Not operate
3	Booster heater output enabled/disabled	Enabled	OFF	ON	Disabled

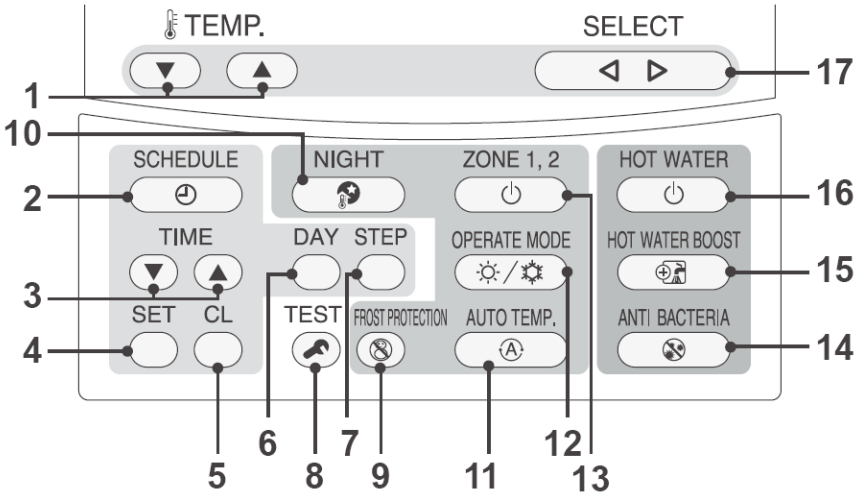
SW12	Description	Switch mode			
		Default setting		Alternate	
1	Hot water supply operation	Valid	OFF	ON	Invalid
2	Zone 1 operation	Valid	OFF	ON	Invalid
3	Zone 2 operation	Invalid	OFF	ON	Valid

SW13	Description	Switch mode			
		Default setting		Alternate	
1	3WV selection – 2 wire/SPST or SPDT	• 2-wire spring return type • 3-wire SPST type	OFF	ON	3-wire SPDT type
2	Boiler output enabled / disabled	Disabled	OFF	ON	Enabled
3	Auto restart for power failure	Auto restart	OFF	ON	Manual restart

SW02	Description	Switch mode			
		Default setting		Alternate	
1	Boiler installation position	Before 3 way valve	OFF	ON	After 3 way valve (heating side)
4	Room thermostat input	Invalid	OFF	ON	Valid

Hydro Unit Remote Control

Buttons

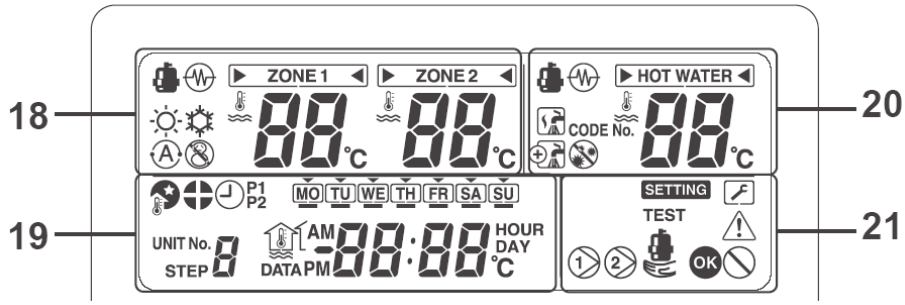


1. TEMP. button: ▼ ▲	Changes the set temperature for each operation mode (ZONE1 / ZONE2 / HOT WATER) by 1°C step.	**10. NIGHT button:**	Controls the night set back operation.
2. SCHEDULE button:	Sets the current time and scheduled weekly operation.	**11. AUTO TEMP. button:**	Switches setting temperature automatically according to outside temperature. (Pressing this button long changes the mode to data setting mode).
3. TIME button: ▼ ▲	Changes time for current time setting and scheduled weekly operation setting with ▼ and ▲ buttons.	**12. OPERATE MODE button:**	Selects ZONE1 / ZONE2 operation mode (heating or cooling).
4. SET button: SET	Determines the entered current time setting and scheduled weekly operation setting.	**13. ZONE1, 2 button:** ZONE 1, 2	Turns on/off the zone (floor heating/radiator/FCU) operation.
5. CL button: CL	Clears settings for the current time and scheduled weekly operation.	**14. ANTI BACTERIA button:**	Regularly increases the hot water temperature in the tank for sterilization. (Pressing this button long changes the mode to data setting mode).
6. DAY button: DAY	Sets days of the week for current time setting and scheduled weekly operation setting.	**15. HOT WATER BOOST button:**	Boosts boiling when high tapping temperature is required temporarily.
7. STEP button: STEP	Specifies switching STEP number in a day for weekly schedule.	**16. HOT WATER button:** HOT WATER	Turns on/off hot water operation.
8. TEST button:	Used for test run or service.	**17. SELECT button:**	Selects an operation mode when changing the set temperature of each operation mode.
9. FROST PROTECTION button:	Controls minimum operation for unused period (going out, absence,etc.) for anti freezing.		

NOTE

Some functions are not provided depending on the system specification in use.

Display Explanation



18: ZONE1, ZONE2	
Display	**Description**
ZONE 1	Lights when floor heater or radiator is connected (when the system has floor heater or radiator).
▶ ZONE 1 ◀	ZONE1 selected for Temperature to be changed.
ZONE 2	Lights when system configured to have 2 zones.
▶ ZONE 2 ◀	ZONE2 selected for Temperature to be changed.
	Lights during heating or cooling operation using the heat pump.
	Lights when the internal heater is energized during heating operation.
	Lights when heating is selected.
	Lights when cooling is selected.
	Lights when the FROST PROTECTION button is pressed and goes out when the button is pressed again.
	Lights when Auto operation is selected.
88	Displays heating/cooling set temperature. (Heating: 20 to 55°C, factory setting: Auto, cooling: 10 to 30°C) Goes out when Auto operation is selected.
°C	Lights when the set temperature or sensor's water temperature is displayed with the 7-segment indicator.

20: HOT WATER	
Display	**Description**
HOT WATER	Lights when hot water supply system is connected (when the system has hot water supply).
▶ HOT WATER ◀	HOT WATER selected for Temperature to be changed.
	Lights when hot water supply operation is performed by heat pump.
	Lights when the internal heater is energized during hot water supply operation.
	Lights during hot water supply operation.
	Lights while hot water boost is activated.
	Lights when the ANTI BACTERIA button is pressed and goes out when the button is pressed again.
CODE No.	Lights when unit enters the data set mode.
88	Displays hot water set temperature. (40 to 75°C, factory setting: 65°C)
°C	Lights when the set temperature or sensor's water temperature is displayed with the 7-segment indicator.

Display Explanation (cont.)

19: TIMER	
Display	**Description**
AM PM 88:88	Clock: Displays the current time (AM or PM).
MO TU	Displays days of the week (Sunday to Saturday).
	Lights when the NIGHT button is pressed and goes out when the button is pressed again.
	Lights when night time quiet operation is set.
P1	Indicates scheduled operation 1 status (including setting time).
STEP 8	Displays the scheduled operation step when the scheduled operation STEP1-5 program is set.
	Lights during time setting and scheduled operation setting.

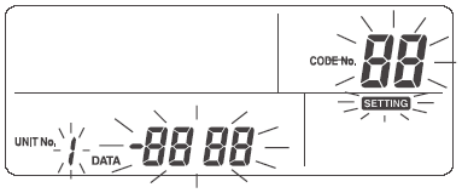
21: CONTROL	
Display	**Description**
1 2	Lights while internal pump (P1) or external pump (P2) is driven.
	Lights during backup operation only by the heater.
SETTING	Lights when the unit enters the data set mode and goes out when the unit exits the data set mode.
	Lights when the unit enters the service mode and goes out when the unit exits the service mode.
	Lights when an error occurs and goes out when the error is cleared.
OK	Lights for two seconds when settings are completed.
	Lights for two seconds when settings failed.

Function Code Access

Set function codes for various operation modes, input using the remote controller.
There are 2 types of settings:-
1) Hydro Unit function code setting.
2) Remote controller function code setting.

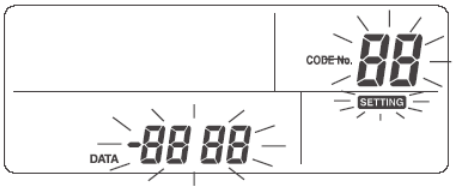
Setting procedure for Hydro Unit function code

1. Press and hold + SET + buttons for four seconds or more to enter the hydro unit function code setting mode.
2. Set the function code number with the TEMP. buttons (CODE No.: 01 to 91).
3. Set data with the TIME buttons .
4. Press SET to confirm the settings.
5. Note that the Clear button CL is enabled only before the SET button is pressed and the function code is changed.
6. Press to exit the settings menu.



Setting procedure for Remote Controller function code

1. Press and hold + CL + TEMP. buttons for four seconds or more to enter the remote controller function code setting mode.
2. Set the function code number with the TEMP. buttons (CODE No.: 01 to 13).
3. Set data with the TIME buttons .
4. Press SET to determine the settings.
5. Note that the Clear button CL is enabled only before the SET button is pressed and the function code is changed.
6. Press to exit the settings menu.



Main setting items (refer to Function code setting table – shown below descriptions)

(1) Setting Hot Water Temperature Range (function codes: 18 to 1F)
• Set the temperature range for heating (zone 1, zone 2), cooling, and hot water.
• The upper-limit and lower-limit temperatures of each mode can be set.

(2) Setting Heat Pump Operation Conditions for Hot Water Supply (function codes: 20 and 21)
• Set the heat pump start water temperature and heat pump stop water temperature.
• The heat pump starts working when the water temperature lowers below the set start water temperature. It is recommended that the default value be used.

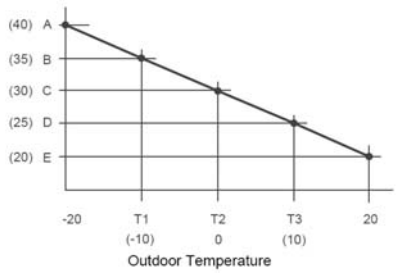
(3) Compensating Hot Water Temperature (function codes: 24 and 25)
• Compensate the target temperature from the remote controller set temperature when the hot water temperature lowers below the set outside air temperature.

(4) Setting Hot Water Boost (function codes: 08 and 09)
• Set the control time and target temperature when the HOT WATER BOOST button on the remote controller is pressed.

(5) Setting Anti-Bacteria (function codes: 0A and 0B / Remote controller 0D and 0C)
• Set the control for the hot water cylinder when ANTI BACTERIA is set with the remote controller.
• Set the target temperature, control period, start time (24-hour notation), and target temperature retention period.
• Make this control setting according to regulations and rules of respective countries.

(6) Setting System Priority Mode (function codes: 22, 23 and 0F)
• Set the outside air temperature that changes the preferred operation mode.
• Hot Water - Heating Switching Temperature
Heating operation takes precedence when the temperature lowers the set temperature.
• Boiler HP Switching Temperature
When the temperature lowers the set temperature, the HP operation stops and the external boiler output is made.
▪ Cooling – Hot Water Priority Selection
Set the priority mode between cooling and hot water when the system is running in cooling mode

(7) Setting Heating Auto Mode Temperature (function codes: 27 to 31)
• Compensate the target temperature when Auto is set for temperature setting on the remote controller.
• The outside air temperature can be set to one of three points (T1 and T3 customisable) within a range of -15 to 15°C.
• The target temperature can be set to a value from 20 to 55°C.
• However, A > B > C > D > E.



• The entire curve can be adjusted plus and minus 5°C by function code 27.

(8) Setting Frost Protection Temperature (function codes: 3A and 3B / Remote controller 12 and 13)
• Set the function when the FROST PROTECTION button on the remote controller is pressed.
• Set enabling/disabling of this function and the target water temperature. (FC3A and FC3B)
▪ Set schedule end day and end time (remote controller: Fc12 and 13)
• If disabling is set, the frost protection operation is not performed even when the FROST PROTECTION button is pressed.

(9) Setting Frequency of Output to Internal Backup Heater (function codes: 33 and 34)
• The increase/decrease time is used to set the response time.

(10) Setting Night Setback (function codes: 26 / Remote controller 0F to 11)
• Set the function when the NIGHT button on the remote controller is pressed.
• Set enabling/disabling of this function, reduction temperature, start time, and end time.
• If disabling is set, the night setback operation is not performed even when the NIGHT button is pressed.

Main setting item (cont.)

(11) Setting second remote controller (room temperature measurement) (function codes: 40, 92, 93, 94, 95, 96, 9D and remote control function codes 02 and 03)
• When system control is required using room air temperature make these settings to enable this function.
• Enable the room temperature control using FC40
• Set upper and lower heating / cooling temperature limits using FC's 92, 93, 94 and 95
• Set initial target water temperatures for heating and cooling using FC's 96 and 9D
• Set room temperature offsets for heating and cooling using remote controller FC's 02 and 03
• Set remote controllers as header / second and room temperature/water temperature functions using DPSW's 1 and 2 on the remote controllers.

(12) Setting 2-Way Valve (for Cooling) Operation (function code: 3C)
• When using both cooling and heating operations and there is an indoor unit only for heating (such as floor heating), install the 2-way valve and set this function code.

(13) Setting 3-Way Valve Operation (function code: 54)
• This setting is not necessary for normal installation. Make this setting to invert the logic circuit in case ports A and B of the 3-way valve are wrongly attached and it cannot be rectified on site.

(14) Mixing valve types and setting (function code: 0C)
• Set the time period from full close to full open of the 2-zone control mixing valve. Set a value that is 1/10 of the actual time.

(15) Setting Heating/Hot Water Switching when Boiler Is Used (function code: 3E)
• When boiler is used, make this setting to operate the Hydro Unit by the instruction from the boiler.

(16) Setting Heat Pump Operating Time for Hot Water Supply Operation (function code: 07)
• Set the time period from the start of heat pump run to the start of heater energization at the beginning of hot water supply operation. If a long period is set, it takes long time for heating water.

(17) Setting Cooling ON/OFF (function code: 02)
• Set this function when performing cooling operation.

(18) Remote controller time indication (function code: Remote controller 05)
• 24-hour or 12-hour notation is selected for the timer.

(19) Setting Nighttimes Quiet Operation (function codes: Remote controller 09 to 0B)
• Issue an instruction for low-noise mode operation to the outdoor unit. Enabling/disabling of this function, start time, and end time can be set.

(20) Setting Alarm Tone (function code: Remote controller 11)
• The remote controller alarm tone can be set.

Function Code Setting

Function Code Setting		Function Code Setting Address		Range	Default
		Hydro Unit	Remote Controller		
(1) Setting Temperature Range	Heating Upper Limit - Zone 1	1A	-	37~55°C	55
	Heating Lower Limit - Zone 1	1B	-	20~37°C	20
	Heating Upper Limit - Zone 2	1C	-	37~55°C	55
	Heating Lower Limit - Zone 2	1D	-	20~37°C	20
	Cooling - Upper Limit	18	-	18~30°C	25
	Cooling - Lower Limit	19	-	10~20°C	10
	Hot Water - Upper limit	1E	-	60~80°C	75
	Hot Water - Lower limit	1F	-	40~60°C	40
(2) Hot Water Operation	Heat Pump Start Temperature	20	-	20~45°C	38
	Heat Pump Stop Temperature	21	-	40~50°C	45
(3) Hot Water Temperature Compensation	Temperature Compensation Outside Air Temperature (°C)	24	-	-20~10°C	0
	Compensation Temperature (°C)	25	-	0~15°C	3
(4) Hot Water Boost	Operation Time (x10 min)	08	-	3~18	6
	Setting Temperature (°C)	09	-	40~80°C	75

Function Code Setting		Function Code Setting Address		Range	Default
		Hydro Unit	Remote Controller		
(5) Anti Bacteria	Setting Temperature (°C)	0A	-	70~80°C	75
	Start Cycle (Day)	-	0D	1~10	7
	Start Time (Hour)	-	0C	0~23	22
	Operation Time (min)	0B	-	0~60	30
(7) Heating Auto Curve Settings	Outside Temperature T1 (°C)	29	-	-15~0°C	-10
	Outside Temperature T2 (°C)	-	-	0	0
	Outside Temperature T3 (°C)	2B	-	0~15°C	10
	Setting Temperature A @ OAT -20°C (°C)	2C	-	20~55°C	40
	Setting Temperature B @ OAT T1 (°C)	2D	-	20~55°C	35
	Setting Temperature C @ OAT T2 (°C)	2E	-	20~55°C	30
	Setting Temperature D @ OAT T3 (°C)	2F	-	20~55°C	25
	Setting Temperature E @ OAT 20°C (°C)	30	-	20~55°C	20
	Ratio Of Zone 2 In Zone 1 Auto Mode (%)	31	-	0~100%	80
	Auto Curve - Temperature Shift (°C)	27	-	-5~5°C	0
(8) Frost Protection	Function 0=Invalid; 1=Valid	3A	-	0~1	1
	Frost Protection Setting Temperature (°C)	3B	-	10~20°C	15
	Frost Protection – Schedule End Day	-	12	0~20	0
	Frost Protection – Schedule End Time	-	13	0~23	0
(9) Back Up Heater Control	Downtime Back Up Heater 0=5min; 1=10min;2=15min;3=20min	33	-	0~3	1
	Uptime Back Up Heater 0=10min; 1=20min; 2=30min; 3=40min	34	-	0~3	0
(10) Night Setback	Change Setback Temperature	26	-	3~20°C	5
	Zone selection 0=Zone 1 & 2; 1= Zone 1 Only	58	-	0~1	1
	Start Time (Hour)	-	0E	0~23	22
	End Time (Hour)	-	0F	0~23	06
(11) Room temperature Remote Controller	Room Temperature Control: 0 = Invalid; 1 = valid	40	-	0~1	0
	Setting Room Temperature Range: Cooling room temperature upper limit (°C)	92	-	15~30	29
	Setting Room Temperature Range: Cooling room temperature lower limit (°C)	93	-	15~30	18
	Setting Room Temperature Range: Heating room temperature upper limit (°C)	94	-	15~30	29
	Setting Room Temperature Range: Heating room temperature lower limit (°C)	95	-	15~30	18
	Room Temperature Offset: Heating room temperature offset value (sensor temperature – control temperature °C)	-	02	-10~10	-1
	Room Temperature Offset: Cooling room temperature offset value (sensor temperature – control temperature °C)	-	03	-10~10	-1
	Initial Target Water Temperature – Cooling: Room temperature controller or external room thermostat (°C)	96	-	10~25	20
	Initial Target Water Temperature – Heating: Room temperature controller or external room thermostat (°C)	9D	-	20~55	40

Function Code Setting		Function Code Setting Address: Hydro Unit	Function Code Setting Address: Remote Controller	Range	Default
(12) Hydro 2 Way Valve Operation Control	Cooling 2 Way Valve - Operation Logic 0=Activated during cooling; 1=Not activated during cooling	3C	-	0~1	0
(13) Hydro 3 Way Diverting Valve Operation Control	3 Way Diverting Valve Operation Logic 0=Activated during hot water operation; 1=not activated during hot water operation	54	-	0~1	0
(14) 2 Zone Mixing Valve Drive Time	Specified Drive Time for Mixing Valve (x10sec)	0C	-	3~24	6
	Mixing valve OFF (control time - mins)	59	-	1~30	4
(15) Boiler/Heat Pump Synchronisation	External Boiler/Heat Pump Synchronisation 0=Synchronised – external boiler stops as temperature reaches hydro unit's temperature setting 1=Not synchronised	3E	-	0~1	0
	Boiler/Heat Pump/Electric Heater Operation During Low Ambient Conditions (controlled using FC23) 0 = HP & boiler operation 1 = Boiler operation only 2 = Electric heater operation only	5B	-	0~2	0
(16) Maximum Operation Time Of Hot Water Heat Pump	Maximum Heat Pump Operation Time In Hot Water Operation Priority Mode (minutes)	07	-	1~120	30
(17) Cooling Operation	0=Cooling & Heating Operation; 1=Heating Only Operation	02	-	0~1	1
(18) Remote Controller Indication	24h or 12h Time Indication 0= 24h; 1=12h	-	05	0~1	0
(19) CDU Night Time Low Noise Operation	Low Noise Operation 0=Invalid; 1=Valid	-	09	0~1	0
	Start Time (Hour)	-	0A	0~23	22
	End Time (Hour)	-	0B	0~23	06
(20) Alarm Tone	Tone Switching 0=OFF; 1=ON	-	11	0~1	1
Pump Control / Synchronisation	Pump P2 Control in Cooling Mode: 0 = P2 continuous operation 1 = P2 stops in cooling mode	64	-	0~1	0
	Synchronise Pump P1 with Room Temperature Control and External Room Thermostat Control: 0 = P1 continuous operation 1 = P1 synchronised with room temperature / thermostat control. P1 will stop when HP in thermo OFF mode	65	-	0~1	0
	Pump P1 Operation: outside Air Temperature Control in Heating Mode (°C): P1 stops when TO > set value in FC9E with DPSW10_2 ON (heating mode only)	9E	-	10~30	20
Pump P2 Remote Controller Display	0=Not Shown; 1=Shown	42	-	0~1	0

Function Code Setting		Function Code Setting Address: Hydro Unit	Function Code Setting Address: Remote Controller	Range	Default
E-Stop Switch Logic / System Restart & TEMPO Control	Forced stop input – switch logic: 0 = Contacts low > high (terminals 1-3 CLOSE) system stop. System restart with remote controller 1 = Contacts high > low (terminals 1-3 OPEN)system stop. System restart with remote controller 2 = Contacts high > low (terminals 1-3 OPEN)system stop. Contacts low > high (terminals 1-3 CLOSE) system restart 3 = Contacts low > high (terminals 1-3 CLOSE) system stop. Contacts low > high (terminals 1-3 CLOSE -second time) system restart (PULSE INPUT)	52	-	0~3	0
	System Restart Logic / TEMPO Control: 0 = System restarts in heating and hot water mode 1 = System restarts in the last mode prior to stopping 2 = System restarts in heating mode 3 = System restarts in hot water mode 4 = TEMPO Control 1: All electric heaters disabled 5 = TEMPO Control 2: HP and all electric heaters disabled	61	-	0~5	0
Hydro Unit Capacity Setting	0012 = 803XWH**E 0017 = 1403XWH**E Factory set but function code is needed for PCB replacement	01	-	0012 or 0017	Depends on Hydro Unit
A02 Error Detection With Boiler Output Enabled	Allows A02 Error Detection to be Activated / Deactivated When Boiler Output Is Enabled: 0 = A02 activated then boiler output OFF 1 = A02 deactivated and boiler output stays ON	62	-	0~1	0
Output Signal Setting	Output Signal Setting with Optional PCB Connected to CN209: 0 = EMG terminals = output On during defrost; OPERATION terminals = output ON when compressor is running 1 = EMG terminals = output ON when error detected; OPERATION terminals = output ON during operation (remote controller ON)	67	-	0~1	0

Settings by Purpose

Settings when hot water supply function is not used

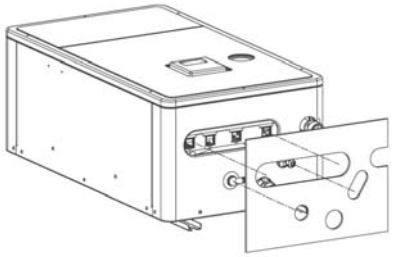
• When the hot water supply function is not used, set DIP SW12-1 on the Hydro Unit board to ON (refer to page 18).

Setting for cooling

• For Space Conditioning Units that do not perform cooling (radiators and Under floor heating, etc.), procure a motorized 2-way valve (for cooling) locally and attach it to the water pipe that is not used for cooling. Connect the valve cables to terminals TB05 (3) and (4) of the Hydro Unit.

• Press and hold (TEST) + (SET) + (◁ ▷) switches on the remote controller to change the Hydro Unit function code, and change address 02 to 0, and then press the SET button to enable the function.

Press the TEST button to exit the setting mode.



• Stick the optional insulation for cooling to the bottom of the Hydro Unit.

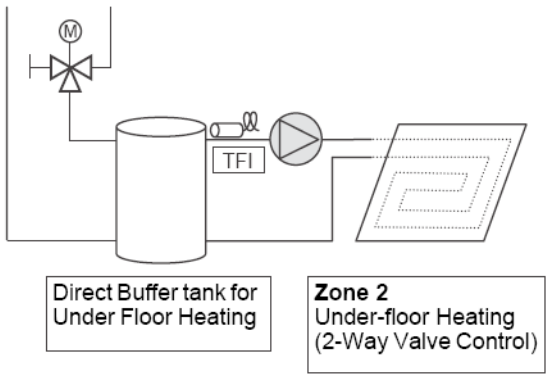
Settings for hot water supply

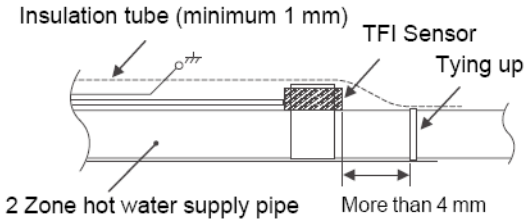
• Prepare the optional hot water cylinder.
• Procure a motorized 3-way (diverter) valve locally and perform piping. Connect the valve cables (as described in Electrical connection section).
• Set DIP SW12-1 on the Hydro Unit board to OFF.
• Connect the power supply unit for the hot water cylinder heater to terminals TB03 L and N of the Hydro Unit.
• Connect cables between the Hydro Unit and the hot water cylinder as follows:

Hydro Unit terminals	TB03 (1), (2), and earth	—	Hot water cylinder (1), (2), and earth
	TB06 A, B, and earth	—	Hot water cylinder A, B, and earth

Settings for 2-zone temperature control

• Procure a motorized mixing valve locally and perform piping. Connect the valve cables (as described in Electrical section).
• Procure a buffer tank locally.
• Procure a water pump locally, and connect its cables (as described in Electrical section).
• To inhibit interlocking the water pump with the internal pump of the Hydro Unit, set DIP SW10-3 on the Hydro Unit board to OFF.
• Set DIP SW12-3 on the Hydro Unit board to ON.
Attach the temperature sensor (TFI) connected to terminals TB06 C and D of the Hydro Unit near the hot water inlet of the Hydro Unit.
• Fix TFI sensor on the room heating supply pipe by using the connector procured in locally.
• Cover the cables with insulation tube (minimum 1 mm) or conduit so that the user cannot touch them directly.
• Cover the TFI sensor's cables and sensor with insulation tube (minimum 1 mm) shown in the diagram on the right.





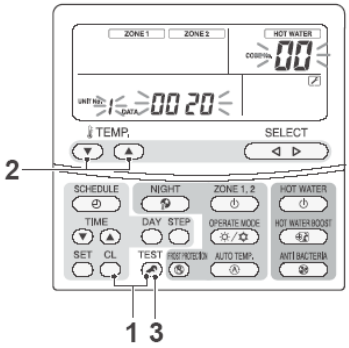
Test Run

Once you have competed the installation and system configuration conduct a test run (see below). Since the protection setting is disabled in the TEST mode, do not continue a test run longer than 10 minutes.

• Press the TEST button on the remote controller. An indication “TEST” appears on the remote controller.
• Press the ZONE1, 2 (ZONE 1, 2) button and select “heating” with the OPERATE MODE button.
The pump is activated in 30 seconds.
If air is not released completely, the flow switch is activated to stop operation. Release air again according to the piping procedure. Little air bite is discharged from the purge valve.
• Check that the air bite sound disappears.
• Check that the hydraulic pressure has become the predetermined pressure 0.1 to 0.2 MPa (1 to 2 bar). If the hydraulic pressure is insufficient, replenish water.
• Heating operation starts. Check that the hydro unit starts heating.
• Press the OPERATE MODE button and select “cooling.”
• Cooling operation starts. Check that the hydro unit starts cooling and that the floor heating system is not cooled.
• Press the ZONE1, 2 (ZONE 1, 2) button to stop operation.
• Press the HOT WATER (HOT WATER) button to start hot water supply operation.
• Check that there is no air bite.
• Check that hot water is present at the connection port of the hot water cylinder.
• Press the HOT WATER (HOT WATER) button to stop the hot water supply operation.
• Press the TEST button to exit the test mode.

Sensor Temperature Monitoring Function

The sensor sensing temperature is displayed on the remote controller. This function allows you to make sure whether the sensor is installed properly.



1) Press + CL buttons for four seconds or more.

2) Select the Code No. with the TEMP. buttons.

Code No.	Location	Indication	Unit
00	Hydro unit	Control Temperature (Hot water cylinder)	°C
01		Control Temperature (Zone1)	°C
02		Control Temperature (Zone2)	°C
03		Remote controller sensor temperature	°C
04		Condensed temperature (TC)	°C
06		Water inlet temperature (TWI)	°C
07		Water outlet temperature (TWO)	°C
08		Water heater outlet temperature (THO)	°C
09		Floor inlet temperature (TFI)	°C
0A		Hot water cylinder temperature sensor (TTW)	°C
0B		Motorized mixing valve position	step
0E		Lo pressure (Ps) x 100	MPa
60	Outdoor unit	Heat exchanger temperature (TE)	°C
61		Outside air temperature (TO)	°C
62		Refrigerant discharge temperature (TD)	°C
63		Refrigerant suction temperature (TS)	°C
65		Heat sink temperature (THS)	°C
6A		Current value (in the inverter)	A
6D		Heat exchanger coil temperature (TL)	°C
70		Compressor operating frequency	Hz
72		Number of revolutions of outdoor fan (lower)	rpm
73		Number of revolutions of outdoor fan (upper)	rpm
74		Outdoor PMV position x1/10	pls
F0	Service Data	Micro computer energized accumulation time	x100hrs
F1		Hot water compressor ON accumulation time	x100hrs
F2		Cooling compressor ON accumulation time	x100hrs
F3		Heating compressor ON accumulation time	x100hrs
F4		Hydro unit AC pump operation accumulation time	x100hrs
F5		Hot water cylinder heater operation accumulation time	x100hrs
F6		Hydro unit heater operation accumulation time	x100hrs
F7		Booster heater operation accumulation time	x100hrs

3) Press button to exit the test mode.

Non-defective operation (program operation)…….No Check code displayed

In order to control the heat pump unit, there are the following operations as the built-in program operations in the microcomputer. If a claim occurs about the operation, please confirm whether it falls under any of the contents in the following table.
If it does, please understand that the symptom is not a defect of the equipment, and it is an operation necessary for the control and maintenance of the heat pump unit.

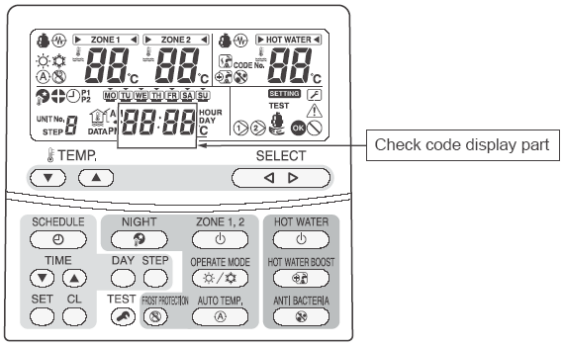
No.	Operation of the heat pump system	Explanation
1	The compressor sometimes does not operate even within the range of compressor “ON”.	The compressor does not operate during the operation of the compressor reboot timer (3 min). Even after the power activation, the compressor reboot timer continues to be active.
2	During the hot water supply or heating operation, without reaching the set temperature, the compressor operation frequency stays at a frequency of less than the maximum Hz or lowers down.	It may be caused by the high temperature release control (release protection control by the temperature of the water heat exchanger) or the current release control.
3	The “Stop” operation on the remote control will not stop the circulating pump. (The same for hot water supply, heating and cooling)	In order to deal with the temperature increase in the heat exchanger after stopping, the operation continues for 1 min after the compressor is stopped.
4	“ON” on the remote control will not operate the compressor. (It will not operate even after the reboot delay timer elapsed)	When the outdoor temperature (TO sensor detection temperature) is -20°C or lower, the heat pump will not operate in order to protect the compressor, and the heater will operate instead.
5	When the power is turned on,operating the remote control. it starts operation without	• The auto restart operation may be working. The • antifreeze operation may be working. If the TWI, TWO • or THO sensor detects a temperature below 4°C, the operation changes from circulating pump --->> circulating pump + heater.)

Defective operation check codes

How to determine from the check code on the remote control

If the defect is limited by the check code displayed on the remote control, please repair the defect based on the table on the next page.

The check codes are separated into two groups: software and hardware errors.
Since a hardware error cannot be cancelled without a part replacement etc., please perform a repair.
If its abnormality is determined, the abnormality is noticed by indicating the check code on the remote control check code display part while letting off a buzzer.



How to cancel a check code on the remote controller

(1) Press ZONE 1, 2 ⏻ or HOT WATER ⏻ button (on the operation side) to clear the check code.

(2) Press CL to stop a buzzer for an abnormality only.

Although the above procedure cancels the check code, the hardware error will be displayed again until the hardware repair is completed.

Hydro Unit check codes

o…..…. Possible
x…. Not possible

Check code	Diagnostic functional operation			Determination and action	Defect frequency confirmation
	Operational cause	Backup present	Automatic reset		
A01	**Pump or flowing quantity error** 1) Detected by TC sensor TC 63°C is detected in the heating or hot water supply heat pump operation (except for defrosting).	×	×	1. Almost no or little water flow. • Not enough vent air • Dirt clogging in the water piping system. • The water piping is too long. • Installation of buffer tank and secondary pump	4
	2) Detected by flow switch abnormality When no signal of the flow switch is showing 2 min after the built-in pump operation started.				2
	3) Detection of chattering abnormality in the flow switch input Chattering detection: Detects input changes (OFF⇔ON) 4 times within 10 seconds during operation.				4
	4) Disconnection of the flow switch connector When the stopped built-in pump starts its operation, the flow switch status is detecting "water flow".			1. Disconnection of the flow switch connector. 2. Defect of the flow switch.	2
A02	**Temperature increase error** (heating) When one of the TWI, TWO and THO sensors exceeds 70°C.	Heating O Hot water ×	O	1. Check the water inlet, water outlet and heater outlet (TWI, TWO, THO) sensors. 2. Defect of the backup heater (defect automatic reset thermostat).	1
A03	**Temperature increase error** (hot water supply) When the TTW sensor exceeds 85°C.	Heating O Hot water ×	O	1. Check the hot water cylinder sensor (TTW). 2. Check the hot water cylinder thermal cut-out.	1
A04	**Antifreeze operation** 1)TWO>20°C condition: 2×TC+TWO < -12°C is detected. 2)TWO 20°C condition: TC+TWO < 4°C is detected. 3)TWI 10°C is detected during defrosting.	O	×	1. Almost no or little water flow. • Dirt clogging in the water piping system. • The water piping is too long. 2. Check the heater power circuit. • Power supply voltage, breaker, power supply connection 3. Set the presence of the backup heater. 4. Check the water inlet, water outlet and heat exchange (TWI, TWO, TC) sensors.	Heating 2 Hot water 2 Cooling 4
A05	**Piping antifreeze operation** Activating the heater under the condition of TWO<4orTWI<4orTHO<4 does not achieve TWO,TWI,THO 5°C after 30 min elapsed.	O	O	1. Check the heater power circuit. • Power supply voltage, breaker, power supply connection 2. Check the water inlet, water outlet and heater outlet sensors (TWI,. TWO, THO). 3. Disconnection of the backup heater.	1
A07	**Pressure switch operation** The pressure switch operates for 300 sec continuously during the heat pump operation.	O	×	1. Almost no or little water flow. 2. Defect of the flow switch. 3. On-load operation under the above conditions. 4. Defect in the pressure switch.	1
A08	**Low pressure sensor operation error** The low pressure sensor detected 0.2 MPa or less.	O	×	1. Almost no or little water flow. 2. Defect of the flow switch. 3. On-load cooling or prolonged defrosting (a lot of frost formation) under the above conditions.	8
				4. Defect in the low pressure sensor.	2

Check code	Diagnostic functional operation			Determination and action	Defect frequency confirmation
	Operational cause	Backup present	Automatic reset		
A09	**Overheat protection operation** When the thermostat of the backup heater activates during the operation of the heat pump or backup heater. When the thermostat operation is activated while it has been stopped.	O	×	1. No water (heating without water) or no water flow. 2. Defect of the flow switch.	2
				3. Defect of the backup heater (poor automatic reset thermostat).	1
A11	**Operation of the release protection** When the TWO release counts to 10.	Heating × Cooling × Hot water O	×	1. Almost no water flow. 2. Defect of the flow switch. 3. Check the water outlet temperature sensor (TWO).	10
A12	**Heating, hot water heater** The antifreeze control is detected under the condition of TWI<20°C while TWI>15°C, TTW>20°C is not detected after the heater backup.	O	O	1. Activated by a large load of heating or hot water supply. 2. Check the heater power circuit (backup or hot water cylinder heater). • Power supply voltage, breaker, power supply connection	1
E03	**Regular communication error between hydro unit and remote controller** When there is no regular communication from the remote control for 3 min, or when no remote control is equipped.	×	O	1. Check remote control connection. 2. Defect in the remote control.	1
E04	**Regular communication error between hydro unit and outdoor unit** The serial signal cannot be received from outdoor.	O	O	1. Check the serial circuit. • Miswiring of the crossover between the water heat exchanger and the outdoor unit	1
F03	**TC sensor error** Open or short circuit in the heat exchange temperature sensor.	O	O	1. Check the resistance value and connection of the heat exchange temperature sensor (TC).	1
F10	**TWI sensor error** Open or short circuit in the water inlet temperature sensor.	O	O	1. Check the resistance value and connection of the water inlet temperature sensor (TWI).	1
F11	**TWO sensor error** Open or short circuit in the water outlet temperature sensor.	×	O	1. Check the resistance value and connection of the water outlet temperature sensor (TWO).	1
F14	**TTW sensor error** Open or short circuit in the hot water cylinder sensor.	×	O	1. Check the resistance value and connection of the hot water cylinder sensor (TTW).	1
F17	**TFI sensor error** Open or short circuit in the floor temperature sensor.	×	O	1. Check the resistance value and connection of the floor-inlet temperature sensor (TFI).	1
F18	**THO sensor error** Open or short circuit in the heater outlet temperature sensor.	×	O	1. Check the resistance value and connection of the heater outlet temperature sensor (THO).	1
F19	**Detection of THO disconnection error** When TWO–THO>15K is detected and 30 sec elapsed.	×	×	1. Check for any disconnection of the heater outlet temperature sensor (THO).	1
F20	**TFI sensor error** When TWO–TFI>30K is detected and TFI<TWI–5K is detected.	×	×	1. Check the connection of the floor-inlet temperature sensor (TFI).	1
F23	**Low pressure sensor error** When PS<0.07 MPa is detected for 90 sec or more (cooling, defrosting). When PS<0.07 MPa is detected for 10 minutes or more (hot water supply, heating)	O	O	1. Check the connection (body or connection wiring) of the low pressure sensor.	1
				2. Check the resistance value of the low pressure sensor.	

Check code	Diagnostic functional operation			Determination and action	Defect frequency confirmation
	Operational cause	Backup present	Automatic reset		
F29	**EEROM error** Inconsistency is detected once without verify ACK after writing to EEPROM.	×	×	1. Replace the water heat exchange control board.	1
F30	**Extended IC error** When the extended IC is abnormal.	×	×	1. Replace the water heat exchange control board.	1
L07	**Communication error** Individual hydro units have a group line.	×	×	1. Replace the water heat exchange control board.	1
L09	**Communication error** The capability of the hydro unit has not been set.	×	×	1. Check the setting of the FC01 capability specifications. HWS-803xx-E = 0012 HWS-1403xx-E = 0017	1
L16	**Setting error** When ZONE1 has not been set, while ZONE2 has been set.	×	×	1. Check the body DP-SW12_2,3.	1

Outdoor Unit check codes

o…….. Possible
x…..Not Possible

Check code	Diagnostic functional operation			Determination and action	Defect frequency confirmation
	Operational cause	Backup present	Automatic reset		
F04	**TD sensor error** Open or short circuit in the discharge temperature sensor.	O	×	1. Check the resistance value and connection of the discharge sensor (TD).	1
F06	**TE sensor error** Open or short circuit in the heat exchange temperature sensor.	O	×	1. Check the resistance value and connection of the heat exchange temperature sensor (TE).	1
F07	**TL sensor error** Open or short circuit in the heat exchange temperature sensor.	O	×	1. Check the resistance value and connection of the heat exchange temperature sensor (TL).	1
F08	**TO sensor error** Open or short circuit in the outdoor temperature sensor.	O	×	1. Check the resistance value and connection of the outdoor temperature sensor (TO).	1
F12	**TS sensor error** Open or short circuit in the suction temperature sensor.	O	×	1. Check the resistance value and connection of the suction temperature sensor (TS).	1
F13	**TH sensor error** Open or short circuit in the heat-sink temperature sensor.	O	×	1. Check the resistance value and connection of the heat-sink temperature sensor (TH).	1
F15	**TE, TS sensors error** Open or short circuit in the temperature sensors.	O	×	1. Check for any wrong installation of the heat exchange temperature sensor (TE) and the suction temperature sensor (TS).	1
F31	**EEPROM error**	O	×		1
H01	**Compressor breakdown** 1 When the operation frequency lowers due to the current release 40 sec or later after the compressor activation and it stops by underrunning the minimum frequency. 2 When the operation frequency lowers due to the current limit control and it stops by underrunning the minimum frequency. 3 When an excess current is detected 0.8 sec or later after the compressor activation.	O	×	1. Check the power supply voltage (AC220 -230 V±10% single phase type). (AC380 – 400V ± 10% 3 phase type) 2. Over-loaded condition of the refrigeration cycle. 3. Check that the service valve is fully open.	8

Check code	Diagnostic functional operation			Determination and action	Defect frequency confirmation
	Operational cause	Backup present	Automatic reset		
H02	**Compressor lock** When the input current is more than zero 20 sec or later after the compressor activation and the activation has not been completed.	O	×	1. Defect of compressor (lock) – Replace the compressor. 2. Defect of compressor wiring (open phase).	8
H03	**Defect in the current detection circuit**	O	×	1. Replace the outdoor inverter control board.	8
H04	**Operation of case thermostat** When the case thermostat exceeds 125°C.	O	×	1. Check the refrigeration cycle (gas leak). 2. Check the case thermostat and connector. 3. Check that the service valve is fully open. 4. Defect of the pulse motor valve. 5. Check for kinked piping.	4
L10	**Unset service PC board jumper** Jumpers J800-J803 have not been cut.	O	×	1. Cut J800-J803.	1
L29	**The communication between the outdoor PC board MUCs error** No communication signal between IPDU and CDB.	O	×	1. Replace the outdoor control board.	1
P03	**The outlet temperature error** When the discharge temperature sensor (TD) exceeds 111°C.	O	×	1. Check the refrigeration cycle (gas leak). 2. Defect of the pulse motor valve. 3. Check the resistance value of the discharge temperature sensor (TD).	4
P04	**The high pressure switch error**	O	×		10
P05	**The power supply voltage error** When the power supply voltage is extremely high or low.	O	×	1. Check the power supply voltage. (AC230 V±23 V)	4
P07	**Overheating of heat-sink error** When the heat-sink exceeds 105°C.	O	×	1. Check the thread fastening and heat-sink grease between the outdoor control board and the heat-sink. 2. Check the heat-sink fan duct. 3. Check the resistance value of the heat-sink temperature sensor (TH).	4
P15	**Detection of gas leak** When the discharge temperature sensor (TD) exceeds 106°C for consecutive 10 min. When the suction temperature sensor (TS) exceeds 60°C for cooling or 40°C for heating for 10 consecutive min.	O	×	1. Check the refrigeration cycle (gas leak). 2. Check that the service valve is fully open. 3. Defect of the pulse motor valve. 4. Check for kinked piping. 5. Check the resistance value of the discharge temperature sensor (TD) and the suction temperature sensor (TS).	4
P19	**The 4-way valve inversion error** When the heat exchange temperature sensor (TE) exceeds 30°C or the suction temperature sensor (TS) exceeds 50°C during the heat pump operation.	O	×	1. Check the operation of the 4-way valve unit or the coil characteristics. 2. Defect of the pulse motor valve. 3. Check the resistance value of the heat exchange temperature sensor (TE) and the suction temperature sensor (TS).	4

Check code	Diagnostic functional operation			Determination and action	Defect frequency confirmation
	Operational cause	Backup present	Automatic reset		
P20	**High pressure protection operation** When an abnormal stop occurs due to the high pressure release control. When the heat exchange temperature sensor (TL) detects 63°C during the cooling operation. When the water outlet sensor (TWO) detects 60°C during the heating or hot water supply operation.	O	×	1. Check that the service valve is fully open. 2. Defect of the pulse motor valve. 3. Check the outdoor fan system (including clogging). 4. Over-filling of refrigerant. 5. Check the resistance value of the heat exchange temperature sensor (TL) and the water outlet temperature sensor (TWO).	10
P22	**Outdoor fan system error** When a DC fan rotor position detection NG, element short circuit, loss of synchronization, or abnormal motor current occurs.	O	×	1. Check the lock status of the motor fan. 2. Check the connection of the fan motor cable connector. 3. Check the power supply voltage (AC230 V±23 V).	1-4
P26	**Short circuit of the compressor driver element error** When an abnormal short circuit of IGBT is detected.	O	×	1. P26 abnormality occurs when operating with the compressor wiring disconnected … Check the control board. 2. No abnormality occurs when operating with the compressor wiring disconnected … Compressor rare short.	8
P29	**Compressor rotor position error** The rotor position in the compressor cannot be detected.	O	×	1. Even if the connection lead wire of the compressor is disconnected, it stops due to an abnormality in the position detection … Replace the inverter control board. 2. Check the wire wound resistor of the compressor. Short circuit … Replace the compressor.	8

Remote controller check codes

Check code	Diagnostic functional operation			Determination and action
	Operational cause	Status of air-conditioning	Condition	
Not displaying at all (cannot operate by the remote control)	**No communication between hydro unit an remote controller** • The remote control wiring is not connected correctly. • The hydro unit has not been turned on.	Stop	–	Defect in the remote control power supply 1. Check the remote controller wiring. 2. Check the remote controller. 3. Check the hydro unit power supply wiring. 4. Check the water heat exchange control board.
E01	**No communication between hydro unit and remote controller** • Disconnection of the crossover between the remote control and the base unit of the indoor unit (detected on the remote control side).	Stop (Automatic reset)	Displayed when the abnormality is detected.	Defect in the reception of the remote control 1. Check the remote control crossover. 2. Check the remote control. 3. Check the hydro power supply wiring. 4. Check the water heat exchanger board.
E02	**Defect in the signal transmission to the hydro unit.** (Detected on the remote control side)	Stop (Automatic reset)	Displayed when the abnormality is detected.	Defect in the transmission of the remote control 1. Check the transmitter circuit inside the remote control. … Replace the remote control.
E09	**Several remote control base units** (Detected on the remote control side)	Stop (The handset continues)	Displayed when the abnormality is detected.	1.2 Check several base units with the remote control … The base unit is only one, and others are handsets.

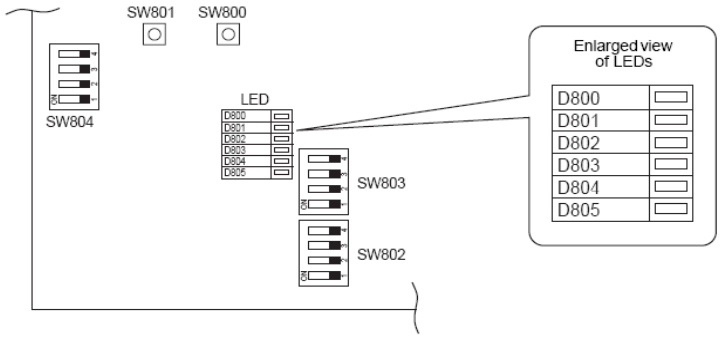
Outdoor Fault Diagnosis

You can perform fault diagnosis of the outdoor unit with the LED's on the P.C. board of the outdoor unit in addition to check codes displayed on the wired remote controller of the hydro unit.
Use the LED's and check codes for various checks.

Check of the current abnormal status

1. Check that DIP switch SW803 is set to all OFF.
2. Jot down the states of LED800 to LED804. (Display mode 1)
3. Press SW800 for at least one second. The LED status changes to display mode 2.
4. Check the code whose display mode 1 equals the jotted LED status and display mode 2 equals the current flashing status of LED800 to LED804 from the following table to identify the cause.

* The LEDs and DIP switches are located at the lower left of the P.C. board of the outdoor unit.



Check of the abnormal status in the past although the abnormal status is not occurred now.

1. Set bit 1 of DIP switch SW803 to ON.
2. Jot down the states of LED800 to LED804. (Display mode 1)
3. Press SW800 for at least one second. The LED status changes to display mode 2.
4. Find an error whose display mode 1 equals the jotted LED status and display mode 2 equals the current flashing status of LED800 to LED804 from the following table to identify the error.

• An outside **air temperature (TO) sensor error** can be checked only while an error occurs.

		DISPLAY MODE 1					DISPLAY MODE 2				
No.	Cause	D800	D801	D802	D803	D804	D800	D801	D802	D803	D804
1	Normal	●	●	●	●	●	●	●	●	●	●
2	Discharge sensor (TD) error	○	○	●	●	○	●	●	◎	●	●
3	Heat exchanger sensor (TE) error	○	○	●	●	○	●	◎	◎	●	●
4	Heat exchanger sensor (TL) error	○	○	●	●	○	◎	◎	◎	●	●
5	Outside air temperature sensor (TO) error	○	○	●	●	○	●	●	●	◎	●
6	Suction sensor (TS) error	○	○	●	●	○	●	●	◎	◎	●
7	Heat sink sensor (TH) error	○	○	●	●	○	◎	●	◎	◎	●
8	Outdoor temperature sensor (TE/TS) connection error	○	○	●	●	○	◎	◎	◎	◎	●
9	Outdoor EEPROM error	○	○	●	●	○	◎	◎	◎	◎	◎
10	Compressor lock	●	●	○	●	○	◎	●	●	●	●
11	Compressor lock	●	●	○	●	○	●	◎	●	●	●
12	Current detect circuit error	●	●	○	●	○	◎	◎	●	●	●
13	Thermostat for compressor activated	●	●	○	●	○	●	●	◎	●	●
14	Model data not set (on the service P.C. board)	●	○	○	●	○	●	◎	●	◎	●
15	MCU-MCU communication error	●	○	○	●	○	◎	●	◎	◎	◎
16	Discharge temperature error	○	○	○	●	○	◎	◎	●	●	●
17	Abnormal power (open phase detected or abnormal voltage)	○	○	○	●	○	◎	●	◎	●	●
18	Heat sink overheat	○	○	○	●	○	◎	◎	◎	●	●
19	refrigerant leak detected	○	○	○	●	○	◎	◎	◎	◎	●
20	4-way valve reverse error	○	○	○	●	○	◎	◎	●	●	◎
21	High pressure release operation	○	○	○	●	○	●	●	◎	●	◎
22	Outdoor fan motor error	○	○	○	●	○	●	◎	◎	●	◎
23	Compressor driver short circuit protection	○	○	○	●	○	●	◎	●	◎	◎
24	Position detect circuit error in one-line display	○	○	○	●	○	◎	●	◎	◎	◎

○ : ON ● : OFF ◎ : FLASHING

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